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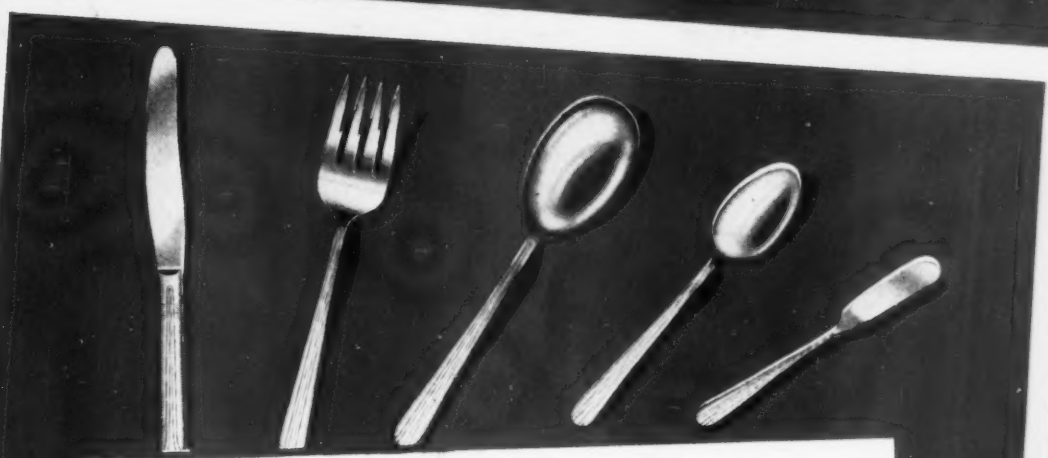

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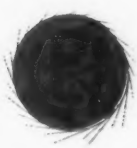

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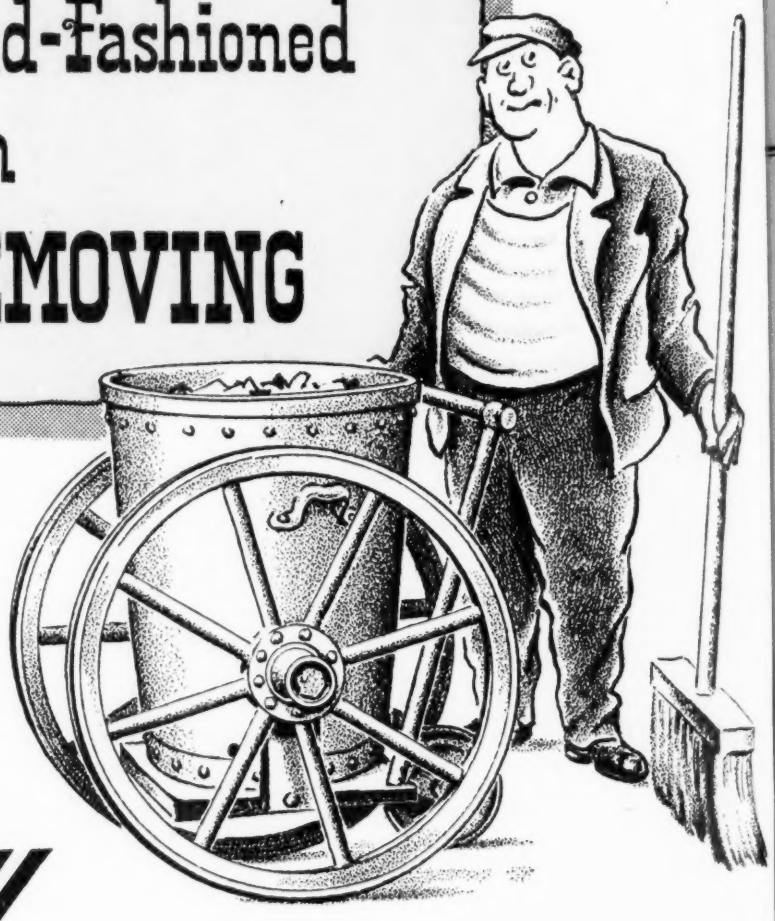

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VOL. 43, NO. 4 METAL FINISHING APRIL, 1945
PREPARATION, ELECTROPLATING, COATING

Price Cutting May Boomerang

Indiscriminate price cutting has been a long-standing evil in the job and contract metal finishing field, more so than in other industries because of the many possible ways of finishing an article.

Sometimes prices are cut with the only purpose of taking a contract away from a competitor. More often low prices are quoted because of miscalculation of production costs due to lack of familiarity with the specific problems connected with the finishing of parts never before handled in the bidder's plant. Most often, however, it reflects the fears of plant operators confronted with a slowing down of operations, such as caused by the recent flurry of cancellations. Often, contrary to the dictates of good judgment, non-profitable jobs will be undertaken, the idea being that such jobs will at least pay the overhead and insure the presence of the working force if and when more work arrives.

Unfortunately, experience has shown that things do not work out just that way. Switching workers from one type of work to another results in lowered efficiency, so that the fill-in job may not even pay the overhead and the profit is decreased on the later job. Also, a non-profitable contract awakens the inclination to cut corners in production, which may lead to rejections and greater loss. It is well known that the job shops which do not indulge in indiscriminate under-bidding are the prosperous ones.

With the O. P. A. now engaged in drawing up a price control order for metal finishing services, the operator who persists in cutting prices may find his action to be a boomerang, since the non-profitable price may be frozen as his established price, not only on one particular item but on all similar products which he may not have finished previously. Although no one will commiserate with him in his predicament, brought about only through his own lack of foresight, consideration for the well-intentioned members of the industry warrants an admonition to the effect that situations may arise where it may be necessary to enter into an involved explanation to the O.P.A. in order to justify bids appreciably higher than that fixed on an article as a result of a price-cutter's thoughtless action.

Plating With Insoluble Anodes

By WALTER R. BINAI

Division Standardizing, Radio Corp. of America, Camden, N. J.

THE use of insoluble anodes has long been a practice in electroplating. In chromium plating, lead anodes are used and the metal deposited on the work is derived entirely from the plating bath. In alkaline tin plating and cyanide copper, as well as in nickel plating, the anode efficiencies are as a rule less than one hundred percent, the deficiency represents that much insoluble anode action. This insoluble anode action causes depletion of metal in the solution, which must be replenished with metal salts. These insoluble anode actions are not desirable and steps are always taken to adjust the solution and plating condition, in order to obtain maximum anode efficiencies (minimum insoluble anode action).

The equilibrium or stability of a plating bath is best when anode and cathode efficiencies are one hundred percent. In time, under such ideal conditions, a solution will become diluted in metal due to drag out. The solution, however, will be free from undesirable decomposition products produced by anode and cathode inefficiencies.

Since the start of the war, so called "non-essential" industries such as record manufacturers, as well as electrotypers, have had difficulty in obtaining copper anodes for use in plating. Consequently they have been forced to use scrap copper for anodes. This condition has prompted several manufacturers to use the insoluble anode system. Both Diggin and Savage have done considerable work along these lines and have been very successful. (Reference A.E.S. Proceedings 1944).

Insoluble Anodes in Acid Copper Solution

The acid copper insoluble anode system offers the least trouble from the standpoint of chemical decomposition. The system consists of two tanks inter-connected by means of a pump and filter for mixing the solution in the system. One tank equipped with insoluble anodes is used as the plating tank, the other tank using scrap copper in open mesh lead coated containers as anodes, is a regeneration tank where copper is regenerated electrolytically by means of semi-permeable diaphragm cups, dilute sulfuric acid electrolyte within the cups and lead cathodes. In the plating tank the cathode efficiency is one hundred percent and the anode efficiency is zero, thus metal is plated out and sulfuric acid liberated. In the regeneration tank the cathode efficiency is zero and the anode efficiency is one hundred percent. Metal is put into solution and none plated out. In this case the sulfuric acid concentration goes down. The reaction may be written as follows:

Plating Tank:

$$2CuSO_4 + 2H_2O \rightarrow O_2 + 2H_2SO_4 + 2Cu$$

Regeneration Tank:

$$Cu + H_2SO_4 \rightarrow H_2 + CuSO_4$$

When these two tanks are connected electrically in series, for every equivalent of copper plated out, an equivalent of copper is put back into solution. See Figures 1 and 2.

There are other advantages aside from using up scrap copper. Where good, uniform distribution of plating is required, the use of conforming anodes is most desirable. Lead anodes can be fabricated into any shape desired to conform the cathode, thus producing a deposit uniform in thickness, whereas a soluble anode would change in shape as it dissolved.

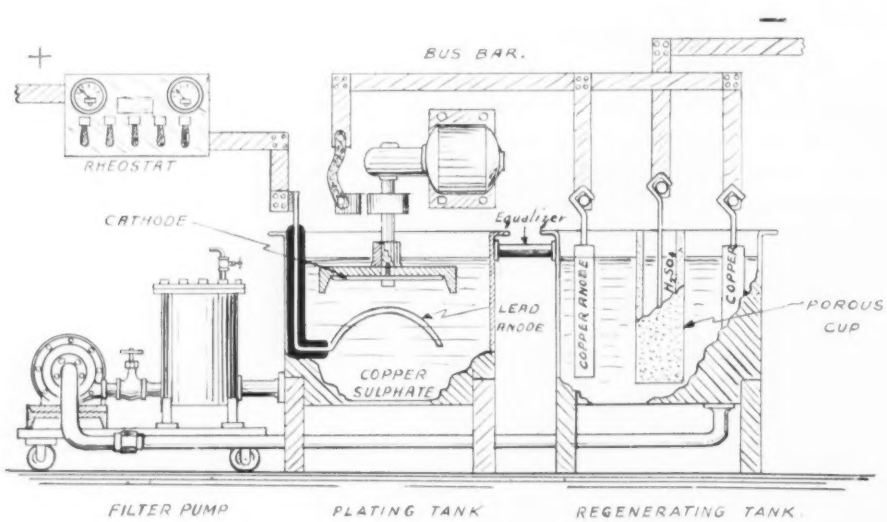


Figure 1

Insoluble Anodes in Cyanide Solution

Insoluble anodes used in cyanide solutions offer more difficult problems than acid copper. Cyanide decomposition products are very unstable and produce secondary decomposition products, liberating carbon dioxide and ammonia. Once a solution is contaminated with decomposition products it is impossible to recondition such a solution economically.

In the manufacture of aircraft bearings, heavy deposits of silver are required to be deposited in small bores. The amount of silver required to be deposited, as a rule, is greater than the weight of silver of a suitable sized internal soluble anode. It becomes necessary to use an insoluble anode in order to produce such parts. The average person would invariably substitute an insoluble anode for a silver anode and think all he need do is add silver cyanide. I, for one, certainly wish it was as simple as that.

When silver is plated from a cyanide bath, using an insoluble anode, the following reaction takes place:

$$2AgCN{\cdot}KCN \rightarrow 2Ag + 2\ KCN + C_2N_2$$

If the solution contains free hydroxides, then the free cyanogen combines with the hydroxide:

$$2KOH + C_2N_2 \rightarrow KCN + KCNO$$

Potassium cyanide and potassium cyanate are formed. Now, when all the free hydroxide is spent, then the cyanogen has nothing to combine with. Cyanogen thus accumulated will polymerize to $(CN)_x$ known as paracyanogen. Cyanogen itself is moderately soluble in water. The aqueous solution is unstable and on standing deposits a brown, amorphous substance of unknown structure called azulmic acid. Apparently azulmic acid and paracyanogen are similar substances, called different names by different authors. This so-called paracyanogen and/or azulmic acid, upon hydrolysis with water will liberate ammonium oxalate, ammonium formate, and also ammonium tartrate.

$$\begin{matrix} C = N \\ C = N \end{matrix} + 4H_2O \rightarrow \begin{matrix} COONH_4 \\ COONH_4 \end{matrix}$$

The solution containing these ammonium organic compounds upon heating will break down, liberating ammonia and carbon dioxide. The ammonia can be readily driven off by heating; however, the carbon dioxide will combine with the potassium salts, forming potassium carbonate. It is actually found in the course of so treating the insoluble anode solution that the carbonate content tends to increase due to the decomposition of cyanates, oxalates, formates, and tartrates, etc. There are many other organic compounds formed in the course of

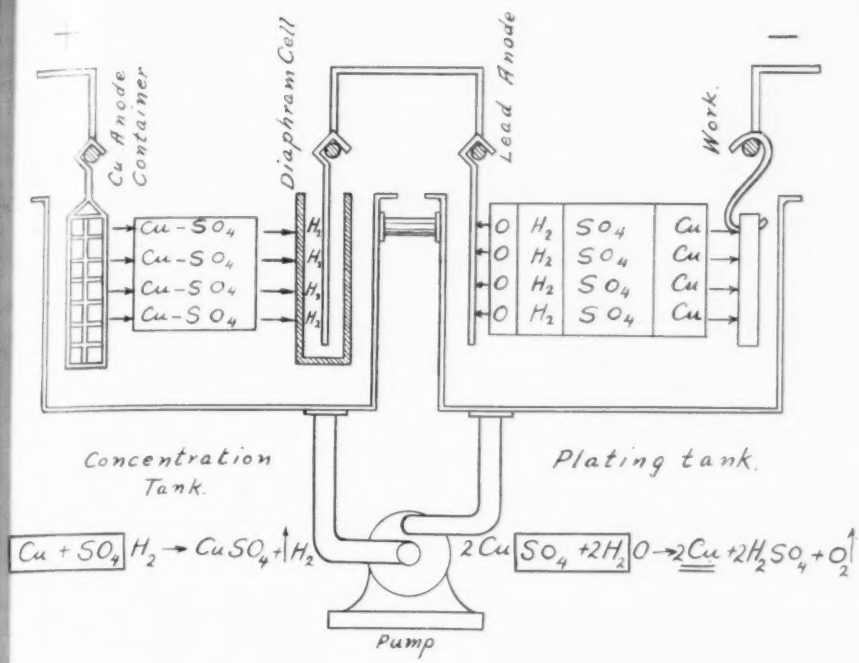


Figure 2

decomposition such as cyanamides, thioureas, cyanic acids, hydrocyanic acid, etc.

Silver Replenishment - Shot Tower

When silver oxide is introduced into the solution during the period of electrolysis, silver oxide will combine with potassium cyanide to form silver potassium cyanide complexes and potassium hydroxide.

$$Ag_2O + 4KCN + HOH = 2KAg(CN)_2 + 2KOH$$

If the addition of silver oxide can be made at a continuous rate, fresh potassium hydroxide will be manufactured at a constant rate. If the rate of silver addition is controlled so as to maintain a constant silver content, then it follows that the cyanogen liberated will not polymerize but will combine with the KOH as described previously. With this method of operation during a period of 380 ampere hours' deposition, there will be a drop of approximately 8.7 grams per liter of potassium cyanide due to the formation of potassium cyanate in a solution volume of 60 liters.

It was found that when silver shot is exposed to an oxygen atmosphere and sprayed with potassium cyanide solution, first silver oxide is formed and subsequently potassium silver cyanide complex and potassium hydroxide:

$$4Ag + O_2 = 2Ag_2O$$
$$Ag_2O + 4KCN + HOH = 2KAg(CN)_2 + 2KOH$$

The cyanogen reaction will take place in the same manner as described before.

A further improvement in operation may be obtained by using an improved plating bath having a pH between 13.2 and 14.0. It was found that this results in a suppression of cyanate formation. When operating at pH values below 13.2, such as a pH of 12.6, for example, it was noticed that no gassing takes place during plating but the potassium cyanide content drops sharply. The drop is equal to that of the theoretical amount of potassium cyanate formed and in the long run the solution becomes contaminated with cyanates.

When operating with a pH range between 13.2 and 14.0, for example, at a pH of 13.6, where the alkalinity of the solution runs approximately 20 grams per liter of free potassium hydroxide, oxygen gas is liberated at the anode during plating. It seems likely that at the higher pH, the cyanogens favor the formation of four molecules of potassium cyanide rather than two of cyanide and two of cyanate. The extra oxygen is liberated:

$$4KOH + 2\,C_2N_2 \rightarrow 4KCN + 2H_2O + O_2$$

If the above reaction is true, then, with a constant silver cyanide content, the free potassium cyanide will also remain unchanged. Several runs were made when the conditions were actually ideal and the composition remained constant throughout.

The use of silver oxide was considered as a metal replenishing agent. It was found not to be very practical to introduce the silver salt at the rate of metal depleted due to plating. Silver oxide, although soluble in potassium cyanide, is quite difficult to put into solution. Adding the silver salt in batches after each plating run also was found to be unsatisfactory. As described before, to maintain solution stability, the free alkali in the bath must not be allowed to run down below a pH of 13.6, therefore, batch addition would be undesirable because the pH may run below the danger point.

Spraying silver shot with cyanide plating solution in an oxygen atmosphere proved to be a temporary practical production method. The amount of silver dissolved in chemical equivalents is proportional to the oxygen equivalents spent. When using this method, close watch of ampere hours and oxygen is most important in order to prevent the solution from spoiling. When a solution is allowed to be run down in hydroxides, decomposition can be identified by the change of color of the solution, this ranges from cherry color to deep reddish brown depending upon the degree of decomposition. The solution will also give off ammonia, which can be detected readily. For plating set up see Figure 3.

Electrolytic Replenishment

Later investigation showed that the electrolytic replenishing method proved to be more reliable and less critical from the control standpoint. The biggest drawback of the electrolytic process was the difficulty of selecting a suitable diaphragm material and the proper selection of anode material. An ideal diaphragm must have the following qualities:

1. Low diaphragm voltage drop.
2. Will not be attacked by plating solution and will not warp.

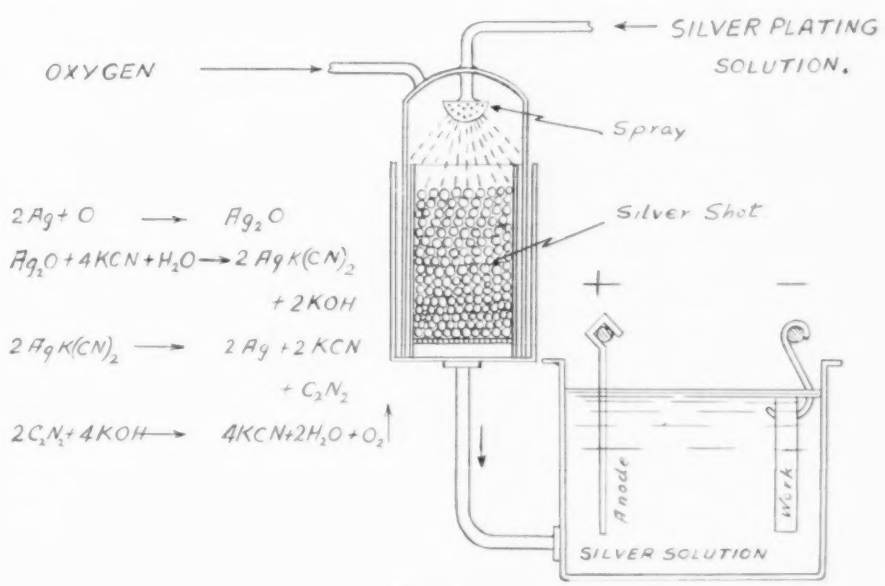


Figure 3

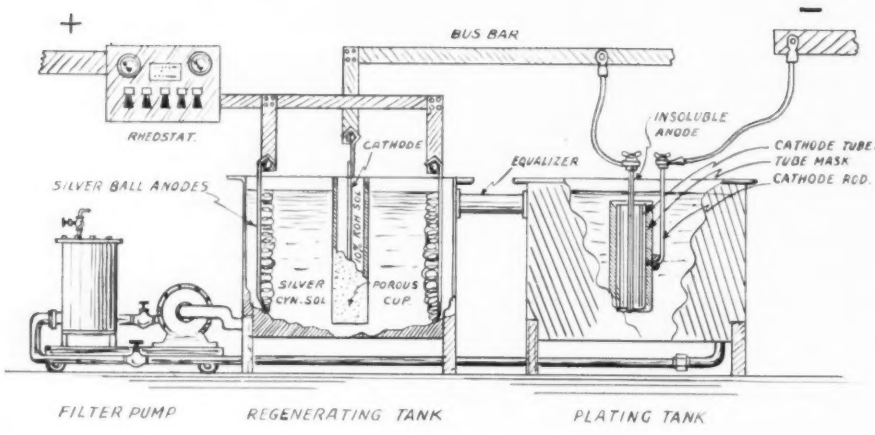


Figure 4

3. Will not permit metal ion diffusion on standing in the plating solution when current is off or on.
4. Must be sufficiently strong mechanically to withstand normal handling.
5. Must be non-conducting and contain no conducting particles.

The electrolytic method, as shown in Figures 4 and 5, consists of two tanks. One tank is used as the plating tank. A suitable insoluble anode is employed. The second tank is used for regeneration of metal salt. This is accomplished by the use of a semi-permeable diaphragm container. A 10% solution of potassium hydroxide is used as an electrolyte within the cup and a stainless steel or cold rolled steel sheet of suitable size is used as cathode. The anode in this tank may be pure silver slab anodes, ball anodes or scrap silver placed in a suitable steel container. The functioning of the diaphragm cup may be explained as follows:

Assume that the silver in the plating bath is in the form of one-half inch diameter marbles and, further, that the diaphragm wall is to be a screen with three-eighth inch diameter holes. The holes are large enough to allow the passage of current, yet too small to let the silver marbles pass through. During the plating operation silver marbles go into solution by electrolysis. They cannot travel beyond the screen due to the small holes. The concentration of marbles thus increase in proportion to the number of ampere hours. In the plating tank where an insoluble anode is used, the metal becomes depleted in the solution because the anode cannot supply silver. The regenerating tank and the plating tank are generally connected electrically in series, therefore, the rate of metal increase in the regenerating tank should equal the metal depletion in the plating tank. These two tanks are connected mechanically with a suitable filter pump and overflow in order to keep the solution in both tanks intermixed.

Trouble Involved

DIAPHRAGM

If the diaghragm is too porous silver ions will migrate into the cup electrolyte. When operation is resumed, this silver will plate out flaky and non-adherent on the cup cathode. These flakes or fine particles will cling to the inner wall of the cup as well as settle to the bottom. These particles are plating nuclei and will plate up through the diaphragm wall and form trees on the outer wall. They will also tree up within the cup and bridge the cup wall and cup cathode. When this happens the cup is rendered useless and causes the plating system to become unbalanced, less metal being put in than taken out, KOH is consumed and after it is spent, cyanogen polymerizes and the bath becomes spoiled.

Diaphragm material must have sufficient porosity to allow at least 40 amperes per square foot to pass with a pressure of not over 3 volts.

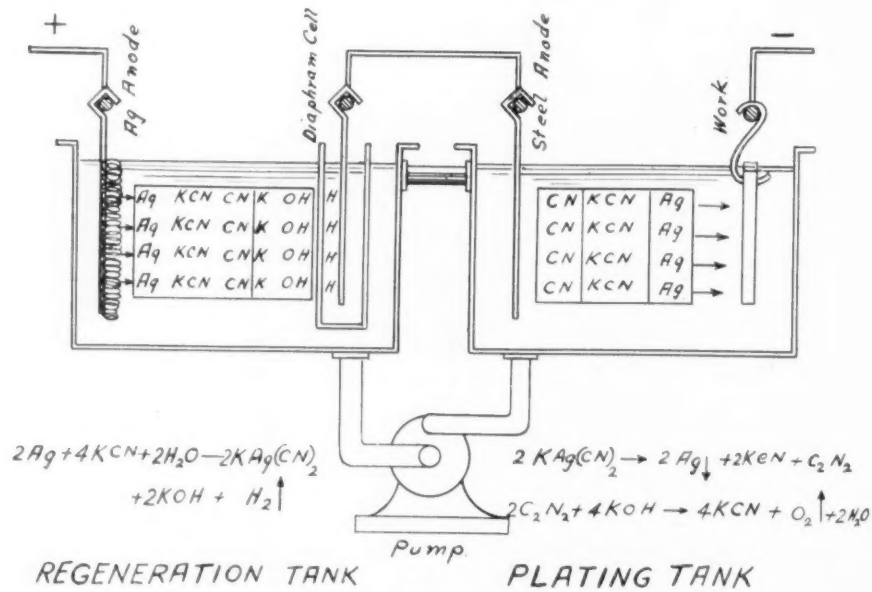


Figure 5

ANODES

Carbon

A carbon anode with a few days' use will disintegrate—mechanical strength not satisfactory.

Duriron

This type of anode must be cast and cannot be machined. Silver will plate out by immersion and flake off into solution, causing rough work.

Stainless Steel

18-8 stainless steel was found to be satisfactory; however, it will dissolve with time and contaminate the solution with potassium ferrocyanide, nickel and chromium. So far as I know, nickel and chromium contamination from the anodes does not cause poor bond. Potassium ferrocyanide in concentration of 12-15 oz./gal. will crystallize out from a silver bath high in silver cyanide. From time to time the solution must be chilled and the ferrocyanide crystallized out.

Cold Rolled Steel

This anode material was found to be satisfactory as stainless steel in performance. It is a cheaper material and does not contaminate the solution with nickel and chromium.

Platinum

This was the best material of all materials used. Platinum plated steel rods were not satisfactory due to porosity. Platinum clad steel rods are excellent but the cost is quite high.

pH OR FREE KOH

The pH or free KOH must be of such value that oxygen gas is liberated at the anode at such a rate that no cyanate is formed.

BRIGHTENER

Organic brighteners are quite unstable in this insoluble anode solution. Inorganic brighteners are more stable. Ammonium thiosulfate, G. E. Super Mix Developer and American Silver Refining Co. A. S. No. 15 were found to be satisfactory and stable in this type of solution and are used commercially. In order that these brighteners function most satisfactorily, the free KOH content must exceed 10 grams per liter of solution. These three inorganic brighteners are all thiosulfates in some form or other. The

(*Concluded on page 170*)

Nomograph on Thicknesses of Electrodeposits

By ARTHUR S. COVERT

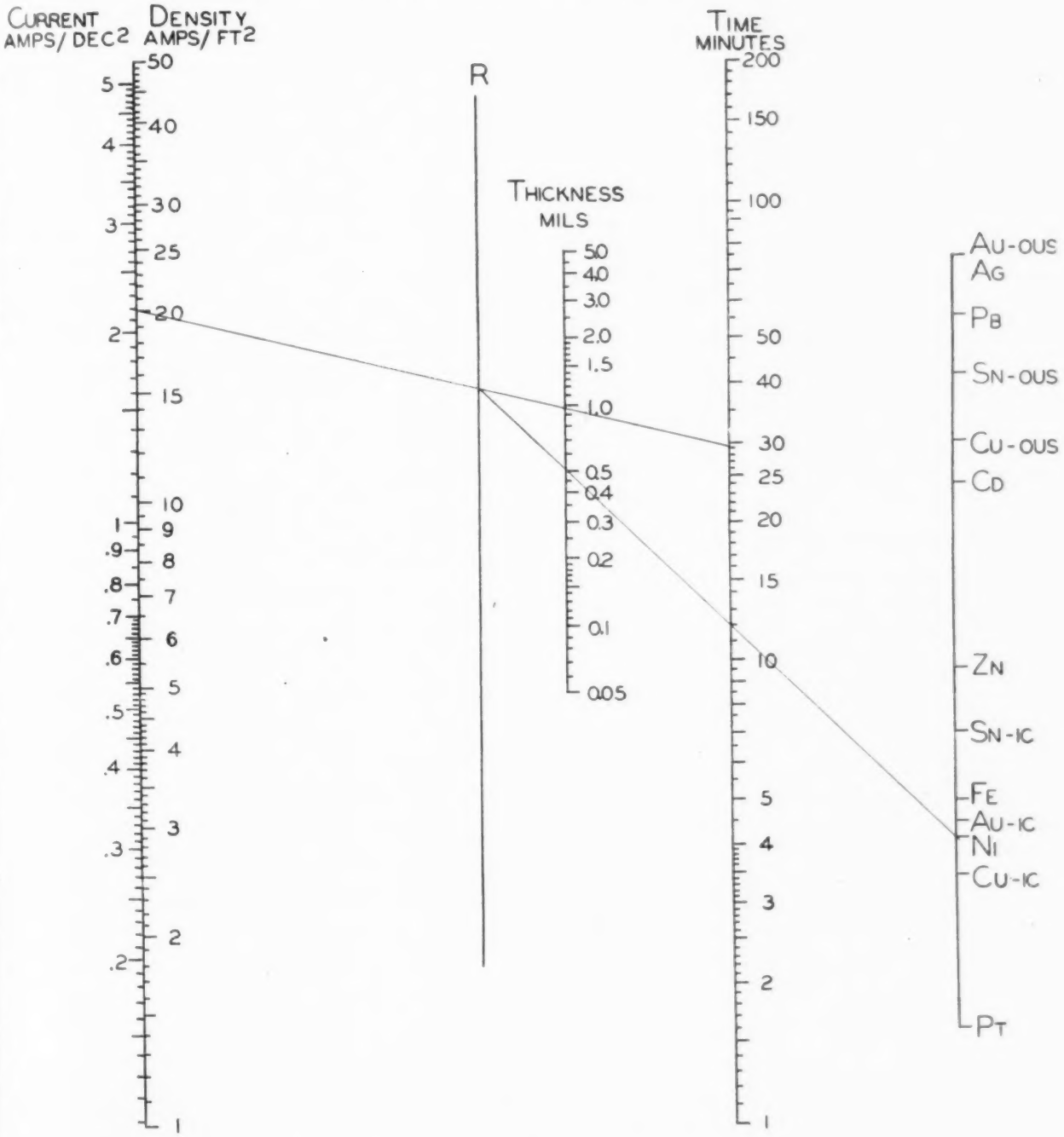
THIS nomograph is designed to answer the questions most frequently met by the plater who wishes to deposit a given thickness of metal. Given the metal to be plated and the current density, it indicates the time required to deposit a given thickness or conversely the thickness achieved in a known time.

For example, suppose it is desired to find the time necessary to produce a nickel plate 0.5 mils (0.0005 inches) thick at a current density of 20 amperes per square foot. To determine this from the chart, draw a line with a straight edge from the nickel point through the 0.5 mil point intersecting the reference line R. This intersection is connected to the 20 amperes per square foot point by another straight line, which when extended to the time scale gives the required time, in this case 29 minutes.

To calculate the amount of metal deposited in a given time, this procedure is reversed.

It must be noted that this nomograph is based on 100% current efficiencies, hence the actual plating times will be greater. Typical current efficiencies for various baths may be found in the *Plating and Finishing Guidebook*. In the above example if the current efficiency were 95% the total plating time would be, 29 divided by 0.95 or 30.5 minutes.

THICKNESS OF ELECTROPLATE



The Cronak Process As Applied to Zinc Plate

By S. E. MAXON*

THE WAR has placed very exacting requirements on the materials used by our armed forces. They must function when called on; at all seasons; at almost any part of the globe. Steel parts are seldom able to resist the climatic exposures unless protected, and since zinc has for years been considered the ideal protective coating for steel or iron, it is natural that it has been used extensively during the war.

Why and Where It Is Used

There are certain conditions, however, where zinc is unable to resist corrosion in its usual manner, and it is necessary to resort to supplemental treatment. Briefly, the conditions under which zinc requires assistance are (1) where exposed for long period of time to condensed moisture; (2) where moisture is entrapped as in a carburetor or fuel pump, or between closely packed articles such as sheets. Under these conditions zinc will corrode quite rapidly, and with the accumulation of white corrosion products. As the result of research work done in the laboratories of The New Jersey Zinc Company a chromate treatment, known as Cronak**, was developed which solved this problem very effectively.

Since the Cronak process is simple and inexpensive, it is widely used and a great deal of interest has been created. There is an almost endless list of war and peace time applications of which the following are typical. Fuze parts, zinc plated steel cartridge cases, zinc alloy carburetors and fuel pumps, radio parts, aircraft parts, locks, telephone and other communication equipment and slide fasteners have been protected by Cronak in whole or in part. It has been used to aid our armed forces, and our allies as well.

It is the object of this paper to outline the steps in the operation, and emphasize a few of the points more commonly overlooked by those unfamiliar with the treatment. More detailed information may be obtained from the sponsors of the process. While the treatment is applicable to any zinc or cadmium surface, this discussion will deal primarily with its use on plated zinc.

General Operations

The first requisite for an acceptable Cronak coating is a reasonably clean zinc surface. Since the most logical procedure is to follow the plating process, it is only necessary to rinse the parts to be treated, with or without an acid dip, and proceed—while the parts are still wet—directly into the Cronak solution. It has occasionally been found when Cronak treating parts which have been plated on bright zinc plating baths that there was some difficulty in removing the brightening agent from the zinc surface. At times it may require electrolytic cleaning instead of or in addition to the acid dip to insure that an adherent Cronak film is obtained. The preferred solution is as follows:

Sodium Dichromate	200 grams	(26.6 av. oz.)
Sulfuric Acid (94% Sp. Gr. 1.84)	6-9 cc.	(.80-1.2 fl. oz.)
Water	1000 cc.	(1 gal.)

This solution is usually held in a glazed earthenware container of appropriate size, but low carbon steel (S.A.E. 1010) or ingot iron may be used. Wood or other organic materials are not satisfactory.

The time of immersion in the solution will vary with the character of the plated zinc, the temperature and acidity of the solution. Usually 10 to 20 seconds will produce the best results. The work should be held stationary in the solution, but if there are holes or recesses it may be given a quick shake when introduced the bath to release entrapped air, and then held stationary.

When removing the work it is desirable to allow the excess so to drain back into the container and, if the draining time do exceed 30 seconds, no harmful results will be obtained.

The work is then carried into a rinse tank of cool water, or a spray rinse. A second rinse in a separate tank—also in cool wa is usually required, but the real requisite is that upon comple of the rinse the water dripping from the work must be clear. I is not achieved, poor coatings will be obtained. This step i portant, and has resulted in trouble for some operators. Further good rinsing will make the drying operation which follows less cri

Drying is probably the operation which causes more trouble all of the others combined. It is not hard to accomplish if the facts are recognized. The film at this point is a very thin, slimy coating, not unlike a very thin paint film. All that is ne sary is to remove the water without disturbing the solids. A pressed air gun will do this efficiently, or if the parts are sm centrifuge is excellent. One of the best ways of drying the is to blow the bulk of the water off the work with compressed and then complete the drying in a drying cabinet or oven with air blowing across the work. Such a cabinet can easily be buil metal or plywood, with doors along the side for access, and wi fan or blower at one end with a hot water radiator in front It is only necessary to remove the visible moisture at this although the film does not acquire its maximum hardness until a 24 hours have elapsed. Hot water must not be used in rinsing, should air hotter than 150°F. be used in drying, as the Cronak can be ruined by excessive heat. The maximum safe time at 1 is 1-hour.

It is desirable to delay acceptance tests until the film is thoroug dry, or for about one day.

If it becomes necessary to strip coatings from the zinc, it ca easily done in a boiling solution of 200 grams of sulphate-free chr acid per liter of water, or by making the work the cathode in alkaline electrocleaning solution. This should not be done in cleaner used to clean the work prior to plating, as the drag-in of chromate to the zinc plating solution will be injurious. Since treated work is seldom as satisfactory, either from an appear or quality point of view, as first-run production, it is probably satisfactory to strip the plate and replate, and then Cronak treat.

Use on Zinc Alloy Die Castings and Rolled Zinc

While this discussion is intended primarily for those using process on plated work, it should be noted that the same operat which have been described will produce satisfactory protect coatings on zinc alloy die castings, or rolled zinc. The only a tional steps required are in cleaning the work in preparation treatment. Parts which have been subjected to machining or dr ing operations will require the removal of any oils or lubrica This can be done in a volatile solvent type of cleaner, prefer with a vapor rinse. Parts which have been degreased and which does not require degreasing should be cleaned cathodic in a hot alkaline solution suitable for zinc. Six ounces of trisod phosphate per gallon of water, or one of the proprietary clea for zinc, may be used.

The rinse which follows this operation must be thorough, bot insure complete removal of all alkaline solution from the work be it enters the acid Cronak bath, and to bring the work down room temperature before proceeding. When this has been done, parts may be introduced into the Cronak solution as previou described.

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* Technical Service, The New Jersey Zinc Company, New York City.

** U. S. Patent 2,035,380. Information regarding licenses may be obtained from The New Jersey Zinc Sales Company, 160 Front Street, New York 7, New York.

Use on Hot-Galvanized Surfaces

If it is desired to treat hot galvanized parts it is advisable to use a solution based on chromic acid. The details of this solution may be secured from The New Jersey Zinc Company.

Maintenance of Solution

After the Cronak solution has been used for some time, it will be found that the coatings are not quite as full-colored. This will usually occur after about 50 square feet of surface per gallon of solution has been treated. The only thing required to restore the solution is to add sulfuric acid. If a glass electrode pH meter is available, the amount may easily be determined. A new solution will have a pH of about 1.0. Satisfactory coatings are not produced when the pH is around 1.7 or more. If sufficient acid is added when the pH reaches about 1.5 to bring it down to around 1.0, satisfactory coatings will again be obtained. If a glass electrode pH meter is not available, a measured quantity of the used solution may be removed, and measured quantities of acid added until samples treated in this solution have the color obtained when the solution was new. By adding a proportionate amount of sulfuric acid to the main tank, satisfactory coatings will again be obtained. After three or four additions of acid, it is usually more expedient to replace the solution than to attempt to maintain it, as the solution costs are low. However, where the drag-in of water and the drag-out of solution is small, it is possible to continue the use of a solution for an indefinite period. Under these conditions it will be necessary to make additions of sodium dichromate as well as sulfuric acid.

Variables of the Process

The Cronak coating is a colloidal film of basic chromium chromate. About 8% is hexavalent chromium, and 28% trivalent chromium. It is exceedingly thin, a normal film having a thickness of only about .00002". Consequently it will reflect the surface on which it is formed. If the zinc plate is burned or dark, the Cronak film will be dark. It will reflect dirty areas or finger marks. If the plating is bright, the film will be bright, or if the plating is deposited on cold rolled surface it will have one appearance, if on a hot rolled or machined surface it will have a slightly different appearance. This does not imply inferior quality, but must be considered in a final evaluation of the quality of the coating. It is therefore necessary to consider both the base and the plate in judging the quality of the Cronak film, and establish standards based on the consideration of all of these variables.

It must also be recognized that the film color will be influenced by the chemical composition of the base surface. Nearly all films show a certain degree of iridescence, and the predominating color will vary with this composition. Most films have a major coloring of golden brown, but blue, green and red are found in varying amounts as well. Organic brighteners are believed to have an influence on the color, and the presence of copper is known to make green one of the major colors produced.

Reasons for Poor Results

Poor films may be due to any one of several things. Inadequate cleaning or rinsing prior to Cronak treatment will result in films which are relatively dull and which tend to have poor adhesion to the zinc surface. Improper rinsing after Cronak treatment will result in spotty coatings which may have poor adhesion, and if drying is not carried out soon after the rinse the areas last to dry will tend to rub off easily. Hot water rinsing or excessively hot air for drying will produce dark chalky coatings that will not adhere well, and furthermore are not protective, since the film composition has been altered by the heat.

If the immersion time in the Cronak solution is too short, a thin coating will be obtained which will be pale in coloring and not as protective as normal films. With preferred conditions of application 10 seconds is the minimum time of immersion, and in most cases 15 seconds is superior.

If the immersion time is too long it is natural to expect thicker and darker coatings. They are generally undesirable, as they are harder to dry and almost always have poor adhesion. They may be confused with films produced on dull zinc plate or those injured by exposure to heat, but by the process of elimination it is possible to distinguish them. Simple rubbing tests on the *dry* film with a rubber eraser or clean white cloth are helpful in evaluating the adhesion of the coatings.

Agitation of the work while in the solution tends to accelerate the reaction to the extent that much larger quantities of zinc are consumed. In extreme cases, the entire zinc plate may be removed. Furthermore, the agitation seems to disrupt the film as it is being formed, with the result that thin films are produced which are not fully protective. With normal processing, not more than .00002" of zinc will be consumed in the reaction.

The presence of copper or brass inserts in the part being treated have a tendency to interfere with normal film formation in that immediate vicinity. While this is undesirable, it is not believed that it is serious, for in the presence of mosture the soluble portion of the film will migrate and protect such areas. No trouble from this source has ever been reported.

Parts which have been subjected to a drawing or forming operation subsequent to zinc plating (this also applies to any rolled zinc parts, zinc alloy die castings or hot galvanized parts) or parts which have been burnished may cause difficulty in cleaning due to retention of the compounds used. Appropriate cleaning methods must be adopted if satisfactory Cronak films are to be obtained.

Handling

The parts being treated may be handled much the same as is done in plating. If the work is racked for plating it is advisable to continue this procedure through the Cronak operations. It will be necessary however, to remove all traces of the chromium from the rack before returning it to the zinc plating cycle, or there may be danger of contaminating the plating solution. A short dip in a weak acid solution will be sufficient to accomplish this.

Parts which have been barrel plated may be treated in steel or ceramic baskets providing their shape is such that there are no large flat areas which would permit adjoining pieces from nesting in a manner which would exclude access to the solution. Steel washers and flat plates are typical of shapes which might be almost impossible to Cronak treat in bulk. It may be necessary to shake the basket vigorously once or twice during the treating period to free air bubbles and be sure that the solution reaches all parts of the surface. It will also be found that greater care must be exercised in rinsing, as small parts usually have a large surface area per unit of weight, and there is a tendency for recesses and small holes to retain the Cronak solution.

Parts which are cup shaped with no holes at the closed end may be treated by placing them in a covered metal mesh box having a depth equal to the depth of the cup, and the other dimensions any reasonable multiple of the diameter of the cup. When the cover is closed the box may then be dipped and inverted in such a manner that no air is trapped and all surfaces are wet by the solution. Rinsing and drying may be carried out in the same container if desired.

There is considerable latitude in the limits of operation, and in the color and texture of the finished product, in the use of the Cronak process. If attention is given to the various operations, it will be found a very simple, inexpensive and effective treatment, which provides zinc or cadmium with a corrosion factor of safety which will easily justify its use. Step by step details have been provided in other references to this subject, and it is hoped that this contribution may assist those who may be in doubt on some phase, or that some suggestion may have been made which will assist in the production of better Cronak coatings.

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Electrodeposition of Iron-Tungsten Alloys from An Acid Plating Bath

By M. L. HOLT[1] and RODNEY E. BLACK[2]

Introduction

THE work reported in this paper is a study of the electrodeposition of iron-tungsten alloys from a plating bath prepared by the addition of small amounts of sodium tungstate to the ferrous ammonium sulfate bath. Previous methods for the electrodeposition of iron-tungsten alloys[4] were based on entirely new types of alloy plating baths. This present work is a part of a general survey, now in progress in this laboratory, investigating the possibilities of electrodepositing tungsten alloys from commercial plating baths which are modified by the addition of sodium tungstate. Its main purpose is to obtain information which may lead to a better understanding of the process by which tungstates are reduced at the cathode during electrolysis, although the possible importance of electrodeposited tungsten alloys is not being overlooked.

Methods and Materials

A number of iron plating baths have been suggested[5] but the ferrous ammonium sulfate bath was chosen for this work because it seemed best suited for the present purpose. The composition used is that recommended by MacFadyen[6] and consists of 350 g./L. of ferrous ammonium sulfate made slightly acid with sulfuric acid. The bath was prepared from stock solutions of ferrous sulfate and ammonium sulfate. The ferrous sulfate solution was treated with iron powder and then acidified with sulfuric acid to a pH of about 2; it was kept in the ferrous state by the presence of metallic iron until used for preparing a bath.

A standard sodium tungstate solution, acidified to about pH 3 with sulfuric acid, was used for addition of tungsten to the iron bath. The acidification of the tungstate solution was necessary to prevent the precipitation of an insoluble iron tungstate upon the addition of sodium tungstate to the ferrous sulfate solution. This bath prepared by adding sodium tungstate to the iron plating bath will be referred to as the "iron-tungsten plating bath."

The pH of the plating baths was in all cases determined by an ordinary glass electrode, and when the bath was used at higher temperatures a special glass electrode was used. The bath as made up had a pH of about 3, and it was adjusted to lower pH values by the addition of 3.5 *N* sulfuric acid.

The volume of plating bath used was 500 ml. and a new portion of the bath was used for each electrolysis. The cathode, 3 cm. x 3 cm., was cut from electrolytic copper foil 0.005 cm. thick and was suspended in the bath by a heavy platinum wire. The anode material was galvanized iron sheet about one mm. thick, from which the zinc had been removed by dilute acid. The anodes were cut to the same size as the cathode and two of them spaced about 5 cm. apart were suspended in the bath by heavy iron wire. Usually two cells connected in series were used for each electrolysis run. The baths were maintained at the required temperature by a suitable thermostat. A copper coulometer was operated in series with the two plating cells and the usual precautions were observed in its operation. In calculating current efficiencies of alloy deposition, due allowance was made for the difference in the electrochemical equivalents of iron and tungsten, 27.92 and 30.65 respectively.

The alloy deposits on the copper cathodes were analyzed by the usual methods. The tungsten was determined by the gravimetric method, involving digesting with HCl + HNO$_3$ and the use of cinchonine.[7] After filtering off the precipitated tungstic acid, the filtrate was made slightly basic with NH_4OH to separate the iron from the copper. The precipitated ferric hydroxide was then dissolved in sulfuric acid, reduced by amalgamated zinc in a Jones reductor, and titrated with a standard potassium permanganate solution.

Experimental Data

The actual experimental work was planned to bring out not only the effect of the amount of added tungstate, but also the effect of variations in the conditions of electrolysis on the iron-tungsten bath. These effects were measured by current efficiency changes, by changes in the composition of the alloy deposits, and the changes in the physical appearance of the deposits. In order to discover the true effects of these various conditions of the iron-tungsten bath, it was usually necessary to use the iron bath under the same conditions.

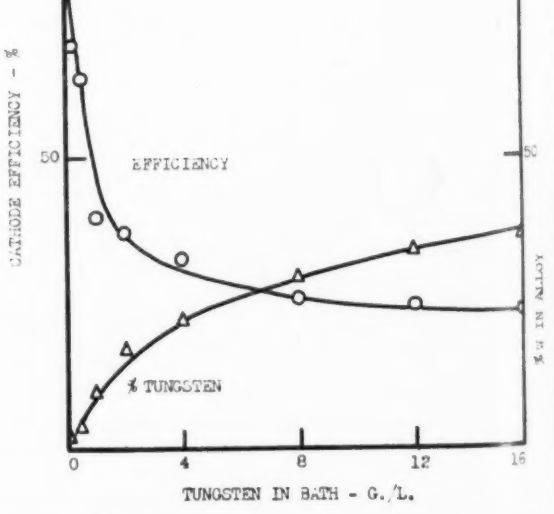

Fig. 1. Effect of added tungstate on the current efficiency of the iron bath and on the composition of the alloy deposit. Temp., 98° C.; pH, 2; c.d., 11.1 amp./dm.^{2}

Presented at the Eighty-second General Meeting of the Electrochemical Society, held at Detroit. Reprinted here with the permission of the Society.

The Amount of Added Tungstate. In the study of the effect of sodium tungstate on the iron bath, electrolysis runs were carried out at 98° C., with a current density of 11.1 amp./dm.², a bath pH of 2, and with various amounts of added tungstate. These electrolysis conditions were used because preliminary experiments had indicated that the best type of cathode deposit was thus obtained. The baths containing sodium tungstate equivalent to 12 and 16 g./L. of tungsten were unstable and tended to precipitate tungstic acid. The baths containing 4 or more g./L. of tungsten became blue on electrolysis due to the reduction of some of the tungstate to the pentavalent state. The results, showing the effect of tungsten concentration on current efficiencies and on the amount of tungsten in the alloy deposits, are presented graphically in Fig. 1. It can be seen that the added sodium tungstate has a marked effect on the iron plating bath. A very rapid drop in current efficiency occurs as the tungsten concentration of the bath is increased to about 1 g./L.; then the decrease is gradual, up to a concentration of about 8 g./L., beyond which the lowering of the current efficiency is quite small. The alloy deposits were all quite metallic in appearance, although those obtained from the baths with larger amounts of added tungsten were rather dark. The percentage of tungsten in the alloy increased with an increase of tungsten in the bath.

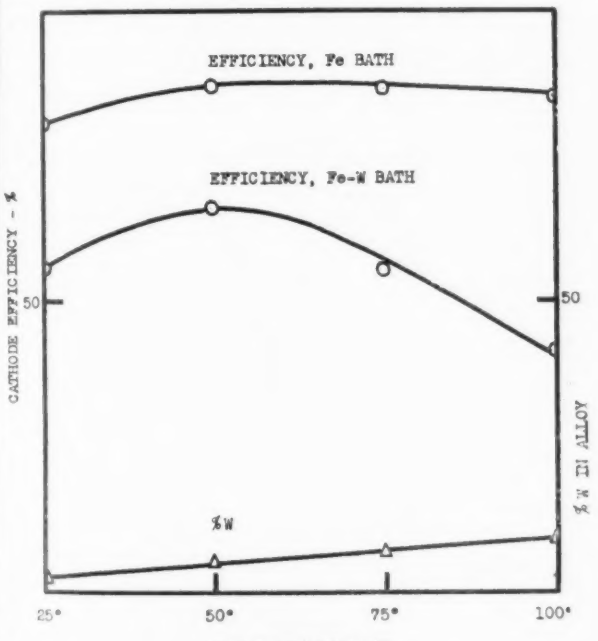

Fig. 2. Effect of bath temperature on current efficiency of the iron bath and the iron-tungsten bath, and on tungsten content of the alloy deposit. C.d., 11.1 amp./dm.²; pH, 2; time, 15 min.

Bath Temperature. In order to determine the best temperature for the electrodeposition of the iron-tungsten alloys, a series of 15-minute plating runs were carried out with the iron-tungsten bath containing 1 g./L. of tungsten at temperatures of 25°, 50°, 75° and 98° C. A current density of 11.1 amp./dm.² and a bath pH of 2 were used in each case. For purposes of comparison, a regular iron bath (no added tungstate) was used in series with the iron-tungsten bath. The results are presented graphically in Fig. 2 and show that temperature has a marked effect on the iron-tungsten bath. The efficiency reaches a maximum of about 50° C. and then falls off somewhat at the higher temperatures. The alloy plates were metallic except those obtained at room temperatures; however, those obtained from the bath at 75° C. were best so far as general appearance is concerned. The amount of tungsten in the alloy deposit increased somewhat regularly with increase in bath temperature. As indicated in Fig. 2, temperature has a very slight effect on the iron sulfate bath.

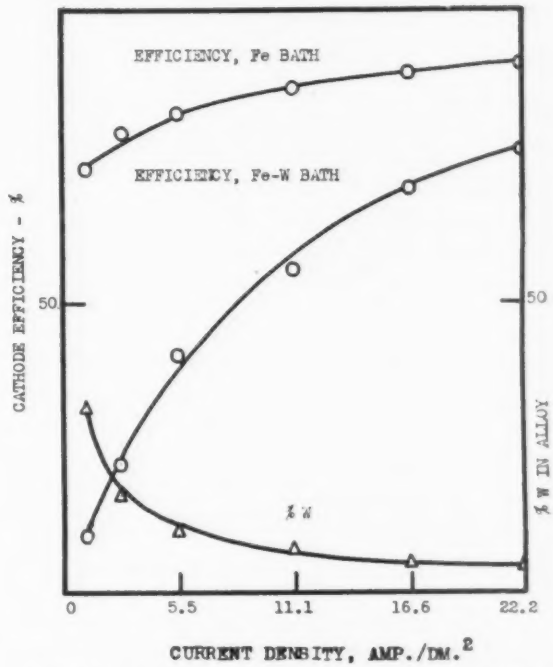

Fig. 3. Effect of cathode current density on current efficiency of the iron bath and the iron-tungsten bath and on tungsten content of the alloy deposit. Temp., 75° C.; pH, 2.

Current Density. Knowing that current density has a marked effect on the current efficiency of the iron-tungsten plating bath, it seemed advisable to study this effect further. A series of plating runs were carried out with the iron-tungsten bath (1 g./L. tungsten) at several current densities (5.5, 11.1, 16.6 and 22.2 amp./dm.²) and the current efficiency was determined in each case. The bath temperature was 75° C., bath pH was 2, and the time of the electrolysis varied from about 2 hours at the lowest current density to 15 minutes for the three highest current densities. The results are presented in Fig. 3. They indicate that the current efficiency of alloy deposition is very poor at the lower current densities and that it increases rapidly with increased current density. The alloy plates obtained at the higher current densities were metallic in appearance, whereas those obtained at lower current densities were much less metallic and perhaps contained oxides. The tungsten content of the alloy is shown in Fig. 3 to decrease with increased current density. It should be mentioned that bath pH after electrolysis at the lower current densities had increased by as much as 0.5 pH unit whereas at the higher current densities the increase was about 0.2 pH unit.

Bath pH. Although preliminary studies had indicated that a bath pH of about 2 was most satisfactory, it seemed advisable to study this effect further. A series of plating runs with the iron-tungsten bath (1 g./L. tungsten) were carried out at different pH's (1.7, 2.0 and 2.5) and the current efficiency determined in each case. The bath temperature was 75° C., the current density was 11.1 amp./dm.², and the time of electrolysis was 15 minutes. The results, presented graphically in Fig. 4, show that an increase of

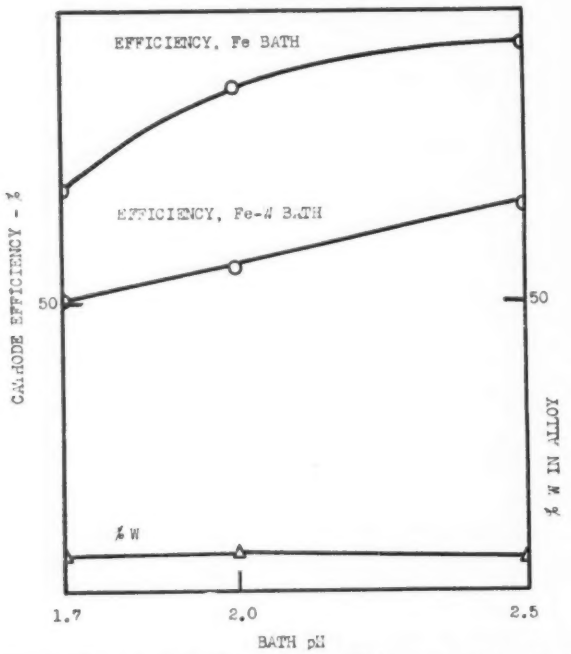

Fig. 4. Effect of bath pH on current efficiency of the iron bath and the iron-tungsten bath and on composition of the alloy deposit. Temp., 75° C.; c.d., 11.1 amp./dm.^{2}; time, 15 min.

bath pH increases the current efficiency of both the iron bath and the iron-tungsten bath. The tungsten content of the alloy deposit was very slightly changed by these changes in bath pH. All deposits were metallic in appearance but some were pitted.

Character of Deposits. The Fe-W deposits which were obtained under the different conditions varied greatly in physical appearance. Many of these alloy plates were smooth, adherent, and metallic and looked like pure iron electrodeposited under the same conditions; other deposits were streaked and pitted as shown in Fig. 5; and some deposits were dark and non-metallic as shown in Fig. 6.

The resistance of the deposits to corrosion by acid varied considerably. In general it may be said that the alloys were not very resistant to attack by HCl, although deposits obtained from baths used at higher temperatures were more satisfactory than the other alloy deposits.

The presence of oxides in some of the alloy deposits was verified by reduction in hydrogen at about 975° C. Some of the dark non-metallic deposits lost as much as 10% in weight when thus heated in hydrogen. Resistance of these reduced deposits to HCl was better than that of the non-treated deposits. When the deposits were heated in nitrogen instead of in hydrogen, they gained weight and became resistant to HCl. When metallic deposits were heated in methane instead of in hydrogen, some of the methane decomposed and the surface of the alloy was coated with carbon. The deposit was converted to a black powder which was very resistant even to aqua regia. When the methane was diluted with hydrogen (about 5% CH_4 by volume) the alloy on heating became darker but it still adhered to the basis metal and there was a considerable gain in weight. The alloy so treated was only slightly attacked by aqua regia.

Theoretical Studies

The Rotating Cathode. It has been shown by Fink, Newbery[9] and Boulach[10] that a rapidly rotating cathode is a useful device for the study of reactions at the electrode during electrolysis. The application of this technic to the study of the electrodeposition of alloys has shown that the composition of the alloys is varied by rotating the cathode. It seemed, therefore, that the use of the rotating cathode with the iron-tungsten plating bath would give valuable information from a theoretical viewpoint.

The rotating cathode apparatus consisted of a special cathode holder mounted on the shaft of a high speed electric motor. This holder was so arranged as to keep a cylindrical copper cathode, of about 15 cm.^{2} effective area, securely in place. All metal surfaces other than the cathode itself were coated with glyptal lacquer. The speed of rotation of the motor was varied by a rheostat in the motor circuit and the r.p.m.'s determined by the stroboscope principle.

TABLE I.—Effect of the Rotating Cathode on the Current Efficiency of the Iron Bath and of the Iron-Tungsten Bath and on the Composition of the Alloy Deposit

Temp., 75° C.; c.d., 22.2 amp./dm.^{2}; bath pH, 2; time, 10 min.

Speed r.p.m.	g./L. W	Wt. of Deposit	Cathode Efficiency	Tungsten in Alloy Deposit
0	0	520 mg.	83%	
1,800	0	325	52	
3,600	0	231	37	
7,200	0	216	35	
0	1	356	57	6.5%
900	1	152	24	12.8
1,800	1	62	10	21.1
3,600	1	22	3	25.8
7,200	1	20	3	23.0

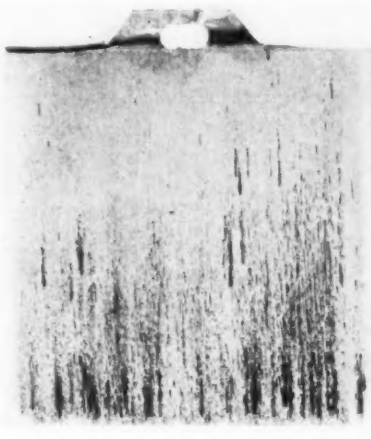

Fig. 5. Streaked, pitted alloy deposit. 1 g./L. W in bath; pH, 2; c.d., 2.5 amp./dm.^{2}; temp., 75° C.

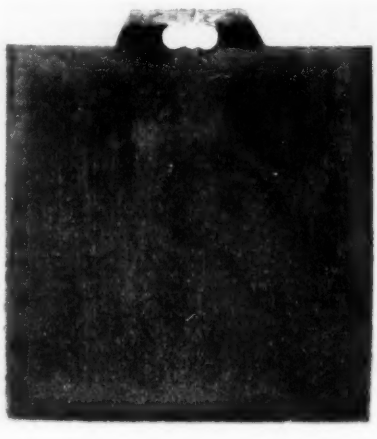

Fig. 6. A dark non-metallic deposit. 1 g./L. in bath; pH, 2; c.d. amp./dm.^{2}; temp., 25

The effect of the speed of rotation of the cathode on the current efficiency of the iron bath and the iron-tungsten bath (5 g./L. tungsten) was studied. The resulting alloy deposits obtained were analyzed to determine the effect of the speed on the tungsten content of the alloy. Electrolysis was carried out at 75° C., a bath pH of 2, and current density of 0.2 amp./dm.^{2}. Results are presented in Table I and show that the cathode efficiency of both the iron bath and the iron-tungsten bath decreases with increase of cathode speed. The tungsten content of the alloy deposit increases in a fairly regular manner with the increase of cathode speed.

Cathode Potentials. The potential of the cathode is probably one of the most important factors controlling the cathode reduction processes. This cathode potential may be regarded as a measure of the potential energy of the discharged atoms, usually hydrogen atoms, which are being liberated at the electrode. Accordingly, a high negative potential implies that the hydrogen liberated has a large energy content and that the capacity for reduction is greater than at lower potentials. Previous studies[11] have indicated that atomic hydrogen liberated at the cathode is involved in the reduction of the tungstate ion to metallic tungsten and thus it was thought that a study of cathode potentials would be of significance when applied to this present work.

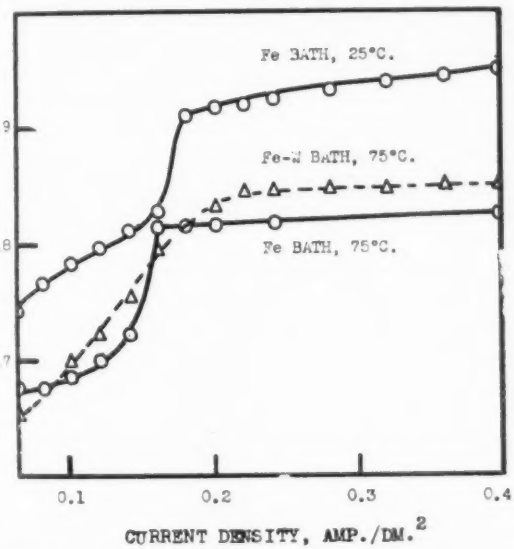

Fig. 7. Effect of current density on cathode potential in the iron bath and the iron-tungsten bath.

The method used for the determination of the cathode potentials is that described by Glasstone and Hickling,[12] where the salt bridge from a calomel cell is drawn to a tip and placed against the cathode. The procedure consisted of varying the current flowing through the electrolysis cell by small predetermined increments and reading the corresponding potential after it became fairly constant. Stirring of the bath was necessary to minimize the pH and concentration changes around the cathode.

The results obtained from studies of the cathode potentials in the iron bath at 25° C. and 75° C. and in the iron-tungsten bath at 75° C. are presented graphically in Fig. 7. The voltage given in each case is for the complete cell composed of the cathode and the calomel half-cell. The distinct break in the curves, particularly for the iron bath, at a current density of about 0.16 amp./dm.^{2} is of particular interest. Only hydrogen is deposited at current densities below this value and iron begins to deposit as the potential increases rapidly. The effect of temperature on the potential at which iron begins to deposit is quite marked; at 25° C. this potential is about 0.9 v., whereas at 75° C. it is about 0.8 v. The cathode potentials observed in the iron-tungsten bath show an increase with increasing current density but the change is more gradual.

Discussion

An explanation of the codeposition of iron and tungsten from the ferrous ammonium sulfate bath with added tungstate must satisfy the following experimental facts: (a) the discharge of hydrogen ions in the presence of the tungstate ion and the resulting decrease in cathode current efficiency; (b) the presence of oxides in some of the electrodeposited alloys; (c) the marked increase in the percentage of tungsten present in alloys plated on a rapidly rotating cathode; (d) the decrease of the tungsten content of the alloy with an increase in cathode current density; and (e) the deposition of metallic appearing iron-tungsten alloys only at elevated temperatures.

The presence of oxides in the deposits may be explained by assuming the presence of a film at the face of the cathode. Such a cathode film would perhaps allow the passage of hydrogen ions but not the heavier metallic ions which may be precipitated in the film as insoluble basic compounds. This film may be partially disrupted at high current densities by the rapid discharge of hydrogen ions within the film, thus permitting the passage of the larger ferrous ions. A similar disruption of this film may occur at elevated temperatures as a result of decrease in viscosity and increase in diffusion rate of the electrolyte. As the discharge of ferrous ions takes place more readily, it would be expected that the cathode efficiency of alloy deposition, and also the percentage of iron in the alloy, would be increased, and this is observed experimentally.

The reduction of the tungstate ion in the iron bath is perhaps accomplished by two processes operating simultaneously: (1) the reduction by atomic hydrogen which is formed at the cathode, and (2) reduction by "unstable, active" iron which is deposited on the cathode.

A number of experimental observations indicate that hydrogen discharged at the cathode is involved in the reduction of the tungstate ion. The marked increase observed in the tungsten content of the alloy deposited on a rotating cathode may be cited as evidence. This would be expected since hydrogen ion concentration and the corresponding concentration of atomic hydrogen are greatly increased at the surface of a rapidly rotating cathode. Further evidence is the fact that a decrease in the bath pH and a decrease of cathode current density were observed to increase the percentage of tungsten in the alloy deposit and to decrease the cathode efficiency. Both these factors control the atomic hydrogen concentration at the cathode; the lowered pH means a greater hydrogen ion concentration and the lower current density means that hydrogen ions are discharged rather than ferrous ions.

The proposal that reduction of tungstate ion may be accomplished by "unstable, active" iron is based on the cathode potential studies. It has been observed that a metallic deposit of iron-tungsten alloy is obtained only at elevated temperatures and that the cathode potential of iron

(*Concluded on page* 176)

The Choice of Plated Coatings

By H. L. FARBER*

SOME ten or twelve metals and alloys are in extensive commercial use as electro-plated finishes. In addition many combinations and variations of these metals are being used to obtain coatings to meet special requirements. A number of factors are involved in determining the kind of metal to be deposited and the finishing system to be used, including the use to which the product is to be put, the base material to be finished, the cost of finish to be used and the facilities required.

Use or Application

The choice of a given kind of plated coating depends to a large extent on the application or use to which the plated article is to be put. Plated coatings are used for decoration, protection or mechanical reasons, or a combination of purposes. More specifically, a coating may be used essentially for appearance and show; for protection from corrosion or rust; for some mechanical or special purpose such as wear resistance; or for building up an area to correct dimensions or possibly as a suitable surface for soldering or brazing to other parts. Specialized coatings are used for heat resistance or to resist chemical attack by food or drugs.

The decorative coatings are chosen to a large extent on the basis of styles and trends which change from time to time. Brushed or Butler finishes may be favored for a few years only to be replaced by bright, lustrous polished surfaces on many articles. Even the color style as well as lustre requirements change. Just prior to the war, gold was highly favored for name plates and escutcheon plates on cars and refrigerators. In many cases the plated coatings are used in combination with other finishes and colors, and the color and finish of the plating is chosen to harmonize with or contrast with other finishes which also have their trends. On some products, the same finish is used over a period of many years.

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Protective plated coatings may be divided into two classes depend on the method of preventing corrosion. Cadmium and zinc are u extensively on parts where appearance is not important but wh extremely good resistance to rust is desired. These metals are an to the basis metal and are sacrificed in themselves. The life of s coatings is nearly a linear function of time in the salt spray corrosive atmosphere to which they are exposed, and depends thickness of deposit used. This type of coating is usually requi on parts which are subject to outdoor exposure or extremely co sive conditions. Films of 0.0005″ or less are usually sufficient.

Resistance to corrosion is also afforded by a number of other pla metals which are more inert in themselves and serve as a shield the basis metal. Nickel, copper, chromium, tin, silver and gold rep sent this class of protective films. The finishes of this type must essentially pore free in order to afford protection to the basis me Thicker coatings are usually required for good protection; films 0.0005″ or more often—0.0010″ thickness being required. Due their chemical inactivity this class of coatings is useful in afford good protection in addition to better appearance over long per of time. However, due to their toxicity, rate of change, and melting and oxidizing temperatures, cadmium and zinc are desirable for many uses. Food handling equipment is usually finish with tin or one of the other metals of that type.

Plated coatings have been used extensively for mechanical a other specialized purposes, especially during the war period. Chro ium is used for gages, cutting tools, dies, engine cylinders a pistons, naval guns, aircraft bearings, radio parts, etc. Due to hardness and wear resistance, chromium is most widely used. Oth metals such as copper and nickel are also used to build up dim sions on worn or improperly machined parts where expensive scarce parts justify salvaging by the use of plating. Plating w silver and tin aids in soldering operations, while copper or silv deposits are used to prepare steel surfaces for brazing.

Zinc Plating Costs

135,068 Fuse Parts—12430 Square Feet

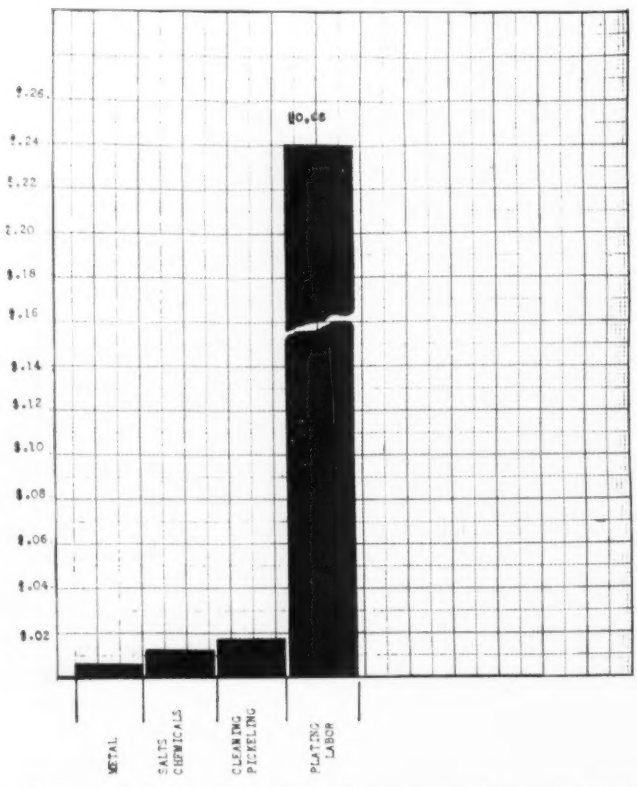


Fig. 1. A breakdown of zinc plating costs for fuse parts. Chart shows the cost of metal, chemicals, cleaning and plating labor.

Nickel and Chromium Plating Costs

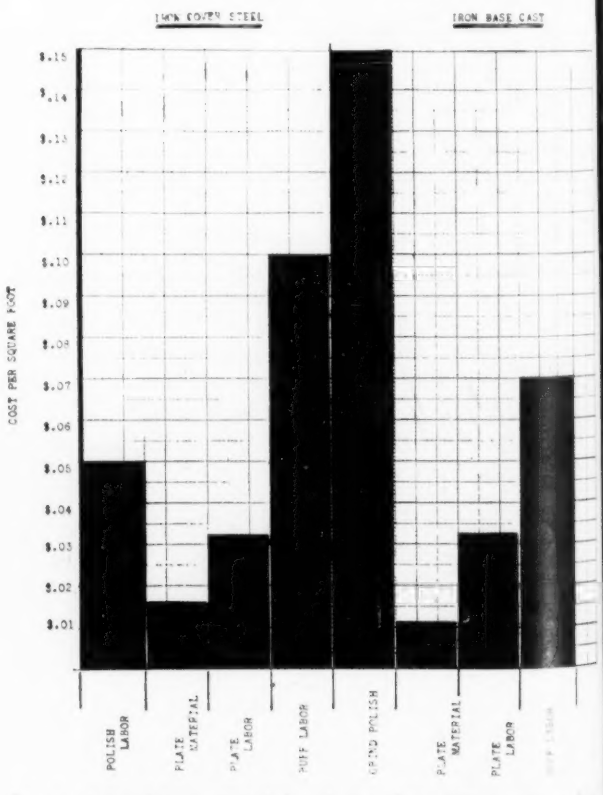


Fig. 2. A breakdown of nickel and chromium plating cost on iron cover steel and on iron base cast.

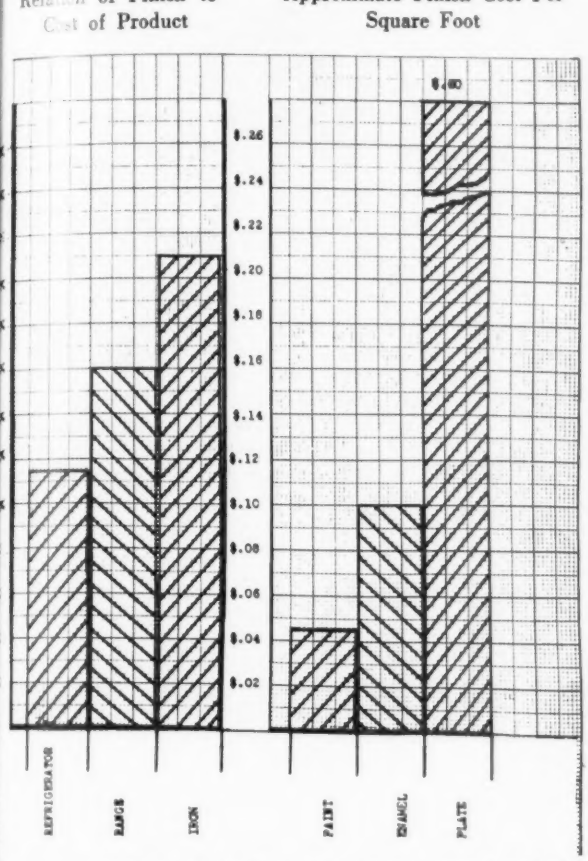


Fig. 3. A comparison of the finish cost of paint, enamel, and plating; and the relation of finish cost to the cost of the end product on refrigerators, irons, and ranges.

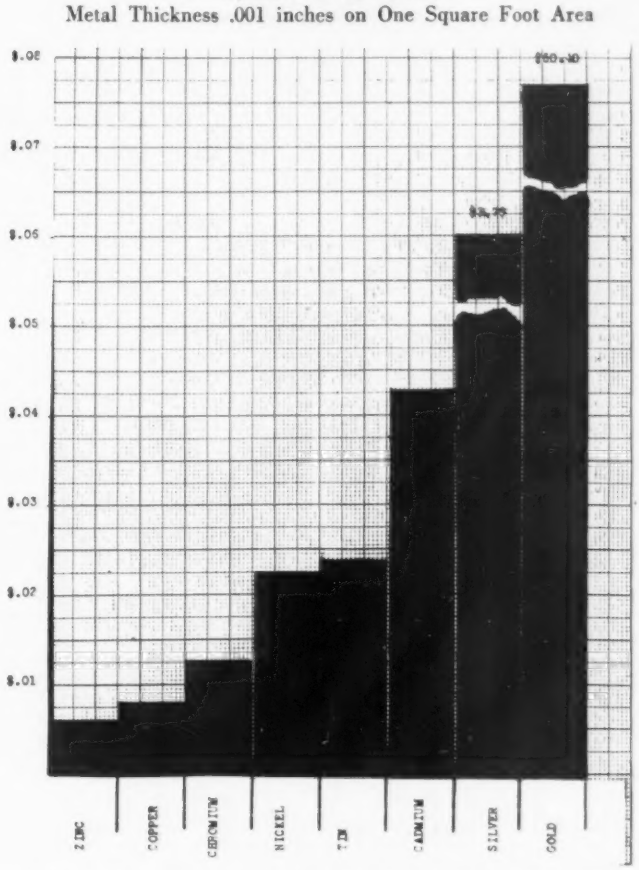


Fig. 4. The metal cost per square foot for various metallic coatings.

Basis Metal

The basis metal composition and the size and shape of the part determines to some extent the type of metal to be used.

Some metals are not plateable or require special processes. The aluminum and zinc metals and their alloys are in this class. Other finishes are sometimes more desirable on these metals as for example, anodizing for aluminum and Cronak treatment for zinc.

The surface properties of some basic metals preclude the use of certain types of plated coatings. Bright nickel and zinc plating for example, do not always work to advantage on cast iron parts. Chromium alloys are difficult to plate with most metals except chromium. The size and shape of a part would receive some consideration in choosing a plated coating. This is important since current requirements and throwing power vary with different metals. Cadmium, which costs 95c per pound, has better throwing power than zinc, which costs 16c per pound, and may be more economical in overall cost when used on irregularly shaped parts where special racking and inside or auxiliary anodes are necessary in order to use zinc.

The corrosion properties of the basis metal must be considered in choosing the coating. Parts made from non-ferrous metals, such as brass and copper, will normally require less protection than those made of iron or steel.

Costs

Another important factor in choosing plated coatings and finishing systems is the cost of the finish to be used.

On the basis of metal cost alone, the different metals cover a range of from 6c for zinc to $50.40 for gold for coatings of one thousandth of an inch on a square foot area. (See chart) Theoretical metal costs are not the complete story in plated finishes since the labor and chemicals used in the operation usually represent more cost than the metal deposited. It costs 46c to apply the nickel and chromium finish on an electric iron but of this amount 20c or 44% is for grinding and polishing, 2.7c or 6% is for plating materials, 6.5c or 14% is for plating labor, 17.1c or 36% is for buffing and coloring. The size, shape and special requirements of a given part are a factor in the plating cost. On a small zinc plated fuse part where the plating requirements are high and the parts intricate in shape, the finishing cost for metal is less than that for other materials used in the operation and much less than that for plating labor.

Other finishes are used alternately with or as substitutes for plating. The choice of finish may involve many factors. Cost as well as properties of the finish have a bearing on determining whether plating is more desirable than some other finish.

Comparison of finishing costs of three products having different finishes shows what part of the product cost is due to finish and the relative costs of different finishes. See curve 3.

Equipment and Facilities

Since electro-plated finishes involve the use of mechanical, chemical and electro-chemical processes a number of operations are involved. The equipment and facilities required depend on the volume of production and the type of finish used. Where large continuous production is involved, it is possible to use automatic equipment and thereby reduce costs for both labor and material.

Equipment of this kind requires long range planning and development work. It is always necessary in deciding on a certain finish to also consider all equipment necessary to produce the finish. This may involve polishing and buffing facilities, cleaning and processing tanks, ventilation equipment, generator and control equipment, plating racks, steam, water, air and floor space. The facilities vary with the type of finish used. For example, chromium plating requires as much as 10 times the current producing equipment of other plated finishes. This means additional investment in generators. In conclusion, it should be realized that due to the many factors involved it is not possible to write a formula for choosing plated finishes. Also, establishing the finish to be used on a product is the joint responsibility of the Sales Department which establishes the customer's demand, the Engineer, who determines the product requirements and the Manufacturing Department, which determines the finish it can consistently and economically produce.

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Baltimore-Washington Branch Act on a Number of Things The March meeting of the Baltimore-Washington Branch of the A. E. S. was attended by a record Washington crowd. The members voted to increase their dues from six dollars to seven dollars a year to provide funds to collect money for the supreme society's research projects and to have something left over to contribute to the research fund. Dr. William Blum pointed out that only one delegate from each Branch will attend the American Electroplaters' Society convention in Pittsburgh this coming June. The Branch voted its approval of the proposed amended Article Six of the A. E. S. by-laws which deals with the research committee. Thomas Slattery, Fred Pierdon and L. G. Tubbs were appointed as a nominating committee for the Branch's next year's officers. President Ken Huston also appointed Matthew J. Kraft, Harvey Borleis, and Frank Davey as the Branch's Audit Committee. Wendell P. Barrows reported that he is busy writing the history of the Branch which he hopes to have finished within the next few months. After Fred Pierdon briefly discussed the needs for electroplating apprentice courses, President Ken Huston announced that he would have representatives of the War Manpower Commission's Apprenticeship Division present their ideas on the subject at the first meeting of the Branch this forthcoming autumn.

What Is a Plater? The educational feature of the Branch's March meeting was a "Stump the Experts" session with Wendell P. Barrows, Gus Soderberg, Dr. William Blum, Fred Pierdon, and Alfred G. Taylor as experts. The judges of the experts' replies to questions asked were Harry Borleis, Albert Fry, Sam Warnock, and Edward Peebles. Tom Slattery acted as moderator. Dr. William Blum, one of the experts, demanded $750 for his evening's services, but Tom Slattery later announced that Dr. Blum had agreed to settle for $3.00 if he could collect it. Since the experts were able to answer all of the questions to the complete satisfaction of the judges, except two, therefore the evening's fun and education cost the Branch only two dollars—one dollar for each question not answered. One of the prize winning questions filled the hall with gales of laughter. The question was: "Define the term plater." Fred Pierdon got up and gave a very dignified definition, after which Tom Slattery remarked: "You have defined an electroplater. I asked you to define a plater." The experts looked puzzled. Then Tom Slattery, to the mirth of everyone present, read: "Webster states that a plater is a man who shoes horses."

Experts Asked Many Interesting Questions Many interesting questions were asked. Here are some of the questions and answers. How can hypo be removed from copper cyanide solution? *Answer:* Hypo can be removed by oxidation with hydrogen peroxide. *Question:* State a method of stripping nickel and copper from a zinc base. *Answer:* Remove the nickel by a reverse current in a bath of sulfuric acid of approximately 55° Bé. Remove copper by immersing the work in a solution of potassium sulfide made up with 1 pound per gallon. This converts the copper to copper sulfide which can be removed by dipping the work in a solution made up with 6 to 9 oz. per gallon of sodium cyanide. *Question:* Does phosphating of steel surfaces prior to silver plating add to the protective value or the bend strength when good plating procedure is followed? *Answer:* No. *Question:* What is the burning point of a normal concentrated (4 oz./gal. silver cyanide pH 11.5) silver bath? *Answer:* 10 amp./sq. ft. *Question:* What is the burning point of a normal concentrated (4 oz./gal. silver cyanide pH 11.5) silver bath using agitation? *Answer:* Above 35 amp./sq. ft. *Question:* At what pH should zinc base die castings be copper plated prior to chromium plating in order to minimize blistering of the plate? *Answer:* Use Rochelle salt copper cyanide bath at pH of 8.6 to 9.4 colorimetrical.

Some More Questions and Answers *Question:* How can a decrease in the throwing power of an alkaline zinc bath caused by using insoluble (steel) anodes be overcome? *Answer:* By lowering the zinc content; or by raising the cyanide content; or by adding 3 to 4 ounces of Rochelle salts per gallon. *Question:* What is a good brightening agent for a cyanide zinc bath? *Answer:* Mercury oxide, or sodium chromate. *Question:* Is the pH of the film surrounding an object being plated in an alkaline plating solution higher or lower than that of the bulk of the main solution? *Answer:* Lower by approximately 1.0 pH. *Question:* What effect does agitation of work in a Cronak solution have on the film? *Answer:* Agitation of the work in the Cronak solution results in thinner and less protective films and a greater loss of zinc. Motion of the work through the solution should be limited to that required by the equipment. *Question:* What plating baths can the Hull Cell be used for in making characteristic studies? *Answer:* Bright nickel; bright acid copper; bright rochelle cyanide copper; high speed copper; bright zinc; acid zinc; cadmium; brass; chromium; lead; acid tin; alkaline tin; silver, and molyblack. *Question:* Name three of the five forms of electrodes used for measuring pH. *Answer:* Hydrogen; quinhydrone; antimony; glass, and glass electrode for high sodium ion. *Question:* When was nickel first plated and by whom? *Answer:* In 1842, a German, R. Boettger, first electroplated nickel. The baths used were either nickel ammonium sulfate or an ammoniacal solution of nickel sulfate. *Question:* When was nickel first plated commercially, by whom, and what was the plate applied to? *Answer:* The first recorded commercial application of nickel plating seems to have occurred in Boston, Mass., during the winters of 1865-1866 when Isaac Adams operated a 20 gallon nickel solution. This solution contained nickel ammonium sulfate and used cast nickel anodes. Mr. Adams plated several hundred gross of cast iron and brass gas tips. Later, in 1869, he was granted the first United States patent for nickel plating. *Question:* What is the accepted method of preparing zinc and zinc castings for silver plating? *Answer:* Copper plate using the cyanide copper bath, observing the precautions in cleaning and in acid dipping that you ordinarily do when preparing the metal for copper plating. *Question:* What is the accepted method of preparing aluminum for silver plating? *Answer:* (a) Alkali etch to chemically clean the surface; (b) Nitric acid (50% or stronger) dip; (c) Cold water rinse thoroughly; (d) Precipitate zinc using proprietory material; (e) Cold water rinse thoroughly; (f) Copper plate (minimum .0001") in cyanide bath; (g) Rinse; (h) Silver strike, and (i) Silver plate. *Question:* What causes cloud effect on cadmium plated steel parts after chromic acid dip? *Answer:* The gray cloud is caused by too much chromic acid in the dip, and the brown color is caused by too little chromic acid. Also, other impurities such as iron (from the make up water) or copper will

cause discoloration. *Question:* What is the Corronizing process? *Answer:* Corronizing is a process for applying a nickel coating to steel and upon the nickel is subsequently applied a zinc or tin coating which is heat treated. Therefore, it is a method of applying tin or zinc upon nickel and heat treating the combination.

Soderberg Resigns as WPB Consultant Karl Gustaf Soderberg has resigned as Cadmium and Electroplating Consultant in the Conservation Officer's office of the War Production Board to become a consultant on plating and corrosion problems and kindred subjects with the firm of Crowley, Graham & Associates of Jenkinstown, Pa., and Chicago, Ill. In July, 1943, he left the Udylite Corporation to do his bit for the war by becoming Head Industrial Specialist on Electroplating and Finishing, and as a Consultant on Lead Coating, in the Conservation Division of the War Production Board. On October 31, 1944, when the Conservation Division was dissolved he became the Cadmium and Electroplating Consultant in the Conservation Officer's office of the WPB. During his service with the WPB his services as a consultant were constantly sought by the War and Navy Departments and by other Government agencies.

Conservation Division Re-Created The WPB created a new Conservation and Salvage Division because of the imperative need for increased conservation and salvage of critical materials. This new division will recommend limitation and conservation orders for issuance by the WPB; and it will develop and establish methods and procedures for accomplishing through appropriate operating units, plans and programs for the collection of waste and scrap materials.

Copper Allotments Under PR 25 Cancelled Because of the pressing need for copper and steel for military and essential civilian products the WPB issued Direction No. 3 to Priorities Regulation No. 25 on March 9, 1945, to announce the cancellation of all steel and copper allotments under PR 25 for the second quarter of 1945.

Cost Accounting Regulation on Contracts Issued War Contractors should get a copy of Regulation No. 14, issued by the Office of Contract Settlement. To this regulation are attached eight cost accounting memorandums which are of considerable importance to contractors in the event a contract is terminated.

Bill Introduced to Replace Cost-Plus Contracts Congressman Thad F. Wasielewski of Wisconsin introduced bill H. R. 2030 which aims to replace the present cost-plus and other systems of contracting for war work with a system of negotiated lump-sum contracts.

Interim Financing for Holders of Terminated Contracts The Office of Contract Settlement issued Regulation No. 13 on February 20, 1945, to facilitate adequate interim financing for holders of terminated war contracts. The new regulation delegates the authority to modify or suspend the penalty to the heads of the contracting agencies. It also prescribes standards under which the penalty may be waived, for overstating claims in connection with interim financing.

Management Consultant Division's Functions James H. Eddy, acting director of the WPB's Management Consultant Division recently pointed out that the functions of his division is (1) to provide technical engineering consultation to management of war plants on the use of wage incentive plans; (2) to work closely with the WPB Office of Labor Production; (3) to advise the War Labor Board on the probable effect proposed wage incentive plans on costs, wages, and production, and (4) to assist in the establishment of joint labor-management committees in essential industries.

Spot Authorization Made More Flexible Priorities Regulation No. 25, as amended February 23, 1945, has made the application for spot authorization more flexible by permitting authorization of civilian production that is not prohibited or limited by an L or M order of the WPB. The amended regulation enables WPB to grant a spot authorization for the production of items where applications for permission to produce those civilian goods were filed under the Controlled Materials Plan or under some other WPB procedure. In these cases, the applicant will receive a deferred allotment if he is given authorization to buy the materials. The amended regulation also permits appeals under orders which are subject to spot procedure.

When War Ends in Europe It is the opinion of the Department of Commerce that if the war in Europe ends early in 1945 the tension on economy will be released; that there will be a substantial curtailment of munitions production; that there will be a freeing of economic resources; that there will be a decline in production volume; that the volume of frictional unemployment will increase, and that there will be reductions in the average work-week and the elimination of overtime.

Advice to Employers on Draft Employees Issued The Office of Manpower Requirements of the WPB issued on March 1, 1945, a four-page publication called "Advice to Employers Regarding Selective Service" to assist employers who are seeking to have the War Production Board certify to local draft boards the irreplaceable and indispensable essential deferred employees under 30 years of age. Copies may be had by addressing the Office of Manpower Requirements, War Production Board, Washington 25, D. C., or by applying to the nearest WPB field office.

Antimony Small Order Exemption Slashed 90 Per Cent Because of the increasing war need for antimony Order M-112 was amended on March 14, 1945, for the purpose of slashing the small-order exemption of this commodity by 90 per cent. In other words consumers are now allowed to buy only 224 pounds of antimony per month without allocation from WPB instead of 2,240 pounds.

Chlorate Chemicals Now Under Schedule 97 of Order M-300 The supply of sodium chlorate is sufficient to permit the removal from allocation such minor chlorates as barium chlorate and barium perchlorate. All chlorates were transferred to the control of Schedule 97 of Order M-300 on March 10, 1945, when Order M-171 was revoked. Schedule 97 raised the small-order exemption from 25 pounds for each chlorate to 250 pounds for potassium chlorate, 300 pounds for sodium chlorate, and 100 pounds for potassium perchlorate.

Cincinnati Chrome Fixture Company Restrained by WPB The Cincinnati Chrome Fixture Company and the Schulte Brass Manufacturing Company of Norwood, Ohio, have been prohibited from manufacturing and delivering bathroom fixtures during the months of March and April because they violated seven War Production Board orders and regulations.

Metal Situation Is Tight Members of the Marking Device Manufacturing Industry Advisory Committee were told by WPB officials at their February meeting that the available supply of certain metals is becoming increasingly tight. To meet military requirements the use of copper and copper base alloy for non-military marking devices will continue to be restricted. The aluminum sheet situation has again become critical. Nickel may be used only where it is required for functional purposes, and for which the use of a substitute is not feasible.

Real Estate May Be Leased After It has been Declared Surplus On February 22, 1945, the Surplus Property Board issued Temporary Order No. 3 which provides that Government owning agencies have the power to lease real property after it has been declared surplus but before the disposal agency has taken custody. These leases may however be revoked at any time so that they will not interfere with final disposition under the Surplus Property Act of 1944, or with a return of the property to war uses, if necessary.

Silver Restrictions May Be Eased At the February meeting of the Silver Producers and Silver Distributors Industry Advisory Committee, the members discussed possible changes of Order M-199. Certain products which are now required to be made from the high priced Treasury or domestic silver (71 cents per ounce) would under the proposed changes be shifted to List A of Order M-199 and thus permit the making of such articles from the lower priced foreign silver (45 cents per ounce). It was learned at this meeting that the total available supply of all silver in 1944 totaled 124,000,000 ounces. The normal annual demand is about 120,000,000 ounces. WPB officials predicted that the imports of foreign silver during the year 1945 will be about the same as in 1944.

Tin Price Increased Foreign Economic Administrator Leo T. Crowley announced on March 3, 1945, that the price to be paid for Bolivian tin during the remainder of the basic tin agreement between Bolivia and the United States will be increased from 60 cents per pound to 63½ cents per pound.

Tin Restrictions Tightened The War Production Board revised Order M-43 on March 8, 1945, because the Government reserve of tin has reached a dangerously low level. The amended order prohibits the use of tin in the manufacture of automobile solder. It limits the use of tinplate to baking pans for institutional and commercial bakers. The order's babbit metal schedule has been reworded so that users of fabricated bearings containing babbit of more than 12 per cent tin by weight must furnish the manufacturer with a use certification.

Placer Tin to be Developed in Mexico It was learned from the Department of Commerce that private interests are planning to operate dredges for the recovery of placer tin from Santiaguillo Lake and San Bartolo Lake, Mexico.

Trichlorethylene and Perchlorethylene Now Under M-300 Trichlorethylene and perchlorethylene were placed under the allocation control of Order M-300 when Order M-371 was revoked on March 3, 1945. Trichlorethylene is under Schedule 94 of M-300. Schedule 94 has reduced the quantity from 10,000 to 3,250 pounds (5 drums) of this chemical per customer without the need for listing individual customers on form WPB-2947. Perchlorethylene, which is controlled by Schedule 95, provides that suppliers must list the names of customers on form WPB-2947 whose orders are more than 7,000 pounds (10 drums) of this chemical per month. When customers order less than 7,000 pounds of perchlorethylene a month the suppliers must list the quantities by end use on form WPB-2947. The small-order exemption of 700 pounds of perchlorethylene has been reduced to less than that amount. And the small-order exemption of 650 pounds of trichlorethylene has been reduced to less than that quantity. The Schedules do not specify how much less.

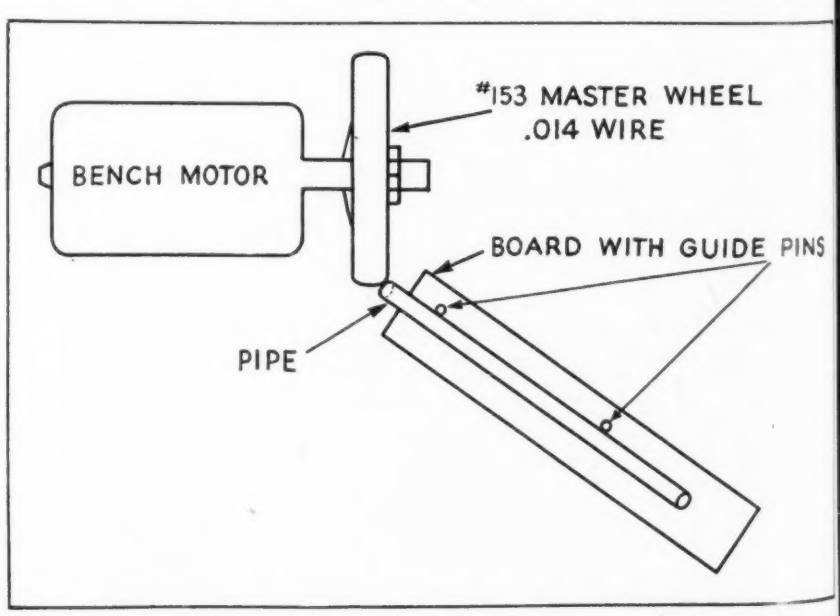
Zinc Under Amended Order M-11-b Zinc for products previously authorized under Priorities Regulation No. 25 (under which spot authorizations are allowed) are now subject to the restriction of Order M-11-b which was amended March 8, 1945. Priorities Regulation No. 25 was amended on the same day to conform with this change.

Power Brush Burring of Steel Pipe Does More Complete Job Faster

Burring the ends of steel pipe by power brushing is faster and the burrs are more completely removed, leaving a uniform radius all around the pipe, according to a large Connecticut manufacturer now employing this method in place of filing or grinding.

The equipment being used is a wire wheel, 8 inches in diameter, with a 1½ inch brush face of .014 wire. It is mounted on a bench motor and the pipes are placed in a rack with pin guides to maintain the proper brushing angle (90 degrees from shaft line) and are turned by hand while in contact with the brush. (See Figure.) The motor turns the brush at the rate of 3,500 revolutions per minute.

The use of power brushes in this operation makes it possible to burr both ends of a steel pipe in ten seconds. The time consumed for the same operation by filing or grinding varied but was considerably greater in most instances. The power brush burring method is applicable to most types of steel pipe.



This top-view sketch shows the proper angle at which pipe is held (90 degrees from buffing so as to accomplish complete removal of burrs and leave a uniform radius around the pipe after completion. The pipe is turned by hand while in contact with the power brush. The bench motor used at an average speed of 3,500 revolutions per minute. (Courtesy Osborn Mfg. Co.

Patents

Abrasive Blasting

U. S. Pat. 2,368,664. W. L. Keefer, assignor to Pangborn Corp., Feb. 6, 1945. A rotor for a centrifugal abrading mechanism comprising a disc having a series of apertures therein, and materials of different densities in said apertures to balance said disc for rotation, sufficient material being placed in each aperture to form a flush surface with the surface of said disc whereby no purchase surface is provided for flying abrasive.

Tin Plating

U. S. Pat. 2,368,749. P. H. Dowling and H. L. Taylor, assignors to The Union Switch & Signal Co., Feb. 6, 1945. The process for making contact with the copper oxide layer of a copper oxide rectifier element which consists in making the element the cathode in a tin plating solution comprising stannous oxalate—50 grams per liter, ammonium oxalate—60 grams per liter, oxalic acid —15 grams per liter, gelatine—2.5 grams per liter, said solution having its pH value maintained between 2 and 4, and passing a current through said solution sufficient to deposit tin on the outer surface of the oxide.

Degreasing Apparatus

U. S. Pat. 2,369,050. A. Helfenstein (Switzerland), assignor to Fr. Sauter A. G. Fabrik elektr. Apparate, Feb. 6, 1945. A plant for cleaning articles, particularly metal articles, smeared with oil, grease or like impurities, comprising a container for baths of impurity-removing solvents, endless conveyor chains having a portion of their stretch adjacent said container, driving means for said chains, article-receiving baskets hung on said chains, a pair of elongated funnels standing over said baths and traversed by the chains and baskets, cooling means associated with the funnels and substantially coextensive therewith, pivotable covers on said funnels, said covers being spring-urged to closed position and rockable to open position by the passing of the baskets, and a pair of carrier tables arranged exteriorly of said container and extending between the funnels and to such positions of adjacency with two sides of the chains that the latter can pick the baskets sequentially off one of the tables and drop them on the other table after they have travelled through the container.

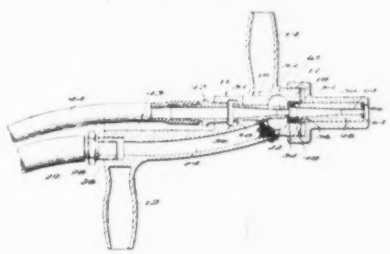
Metallizing Glass

U. S. Pat. 2,369,350. C. D. Haven, assignor to Libbey-Owens-Ford Glass Co., Feb. 13, 1945. The process of metalizing glass, including the step of spraying a molten metal alloy upon the glass comprising approximately 1.75% to 2.25% titanium, approximately .10% to .60% chromium and the balance substantially all copper.

Centrifugal Blasting

U. S. Pat. 2,369,408. W. A. Rosenberger, assignor to Pangborn Corp., Feb. 13, 1945. In an abrading apparatus, a rotor mounted for rotation at high speed and having at least one abrasive deflecting blade unit provided thereon; said unit having a comparatively long abrasive accelerating and propelling surface beginning near the inner end and extending to the outer end of said blade unit, the inner end of said blade unit having an axially directed deflector portion projecting laterally beyond the side edges of the abrasive accelerating and propelling surface thereof into an abrasive pick-up zone, said deflector portion having a generally helical deflecting surface, and means for feeding abrasive onto said helical surface of said deflector portion only while said helical surface is passing through a predetermined arc of rotation, whereby said abrasive is rapidly deflected axially, and introduced onto the inner end of said accelerating and propelling surface while the latter is passing through a predetermined arc of rotation and is discharged from the outer end thereof at an abrading velocity in a predetermined direction.

Abrasive Blast Gun

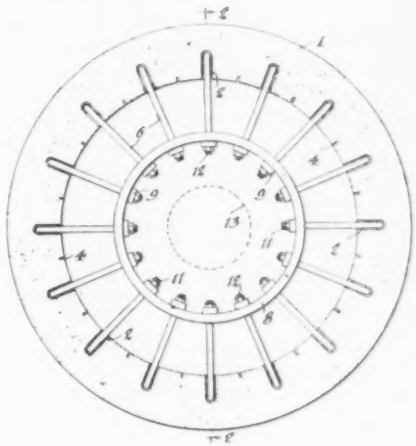


U. S. Pat. 2,369,576. W. L. Keefer, assignor to Pangborn Corp., Feb. 13, 1945. In a blast gun, an elongated gun body having an opening in the forward end thereof and a cavity rearwardly of said opening and a passageway extending rearwardly from the cavity, a removable sleeve mounted in the opening at the forward end of the gun body, a flange carried by said sleeve engaging the forward end portion of the gun body, a nozzle member mounted in said passageway extending through said cavity into the rear end of the sleeve to provide an annular opening between the inner surface of the sleeve and the exterior surface of the nozzle member, a flange carried by the nozzle member engaging the gun body limiting the forward movement of the nozzle member, means for supplying a propelling medium under pressure to said cavity and around said nozzle member through said annular opening to provide a partial vacuum in said sleeve for drawing abrasive through said nozzle member, a discharge nozzle having a bore extending therethrough, a conical surface formed within the forward end of said sleeve, a conical surface on the rear end of said discharge nozzle, and removable means maintaining the discharge nozzle in substantially axial alignment with the axis of the sleeve and the conical surface thereon in seating engagement with the conical surface within said sleeve.

Tinning Copper

U. S. Pat. 2,369,620. J. D. Sullivan and A. E. Pavlish, assignors, by mesne assignments, to Battelle Development Corp., Feb. 13, 1945. The method of forming an adherent tin coating on a cupreous surface, said method comprising contacting said cupreous surface with an aqueous acidic solution for a time sufficient to deposit the desired amount of tin coating, and thereafter removing said surface from contact with said solution, said solution containing, per liter, from 1 to 100 grams of concentrated sulfuric acid, from 10 to 100 grams of thiourea, and dissolved tin equivalent to that obtained by the addition of from 0.5 to 20 grams of $SnCl_2 \cdot 2H_2O$.

Reinforced Abrasive Wheel



U. S. Pat. 2,369,639. A. L. Ball and P. H. Walker, assignors to The Carborundum Co., Feb. 20, 1945. A reinforced abrasive wheel comprising an integral abrasive annulus of relatively large diameter, said annulus being relatively thin in a radial direction as compared to its total radius, said annulus being provided with a plurality of pairs of opposed radial slots on the sides thereof extending from the inner circumference of the abrasive annulus for a substantial distance toward the outer circumference thereof, said slots being spaced equally about the abrasive annulus, there being an inwardly directed bore connecting to the outermost portion of each slot, said bore being of substantial depth and being directed angularly toward the axis of the annulus, said annulus being provided with a plurality of spokes having long and short portions directed at an acute angle to each other, the short end of each of said spokes being each inserted into one of the angularly directed bores in the annulus and being fitted and held therein by means of a hardened cast metal seat, the long ends of the spokes being threaded and being directed radially of the abrasive rim, the outer parts of the long ends being received in the radial slots in the abrasive annulus, a strong metal annulus of substantially smaller diameter than that of the abrasive annulus and of such width as to fit snugly between the long portions of opposed pairs of spokes, said metal annulus being located coaxially of the abrasive rim, a plurality of strap members, each having a hole at each end thereof and

so spaced as to fit over the long ends of two opposed spoke members, said straps being positioned parallel to the axis of the metal annulus and in contact with the inner face thereof, and a nut on the threaded end of each long portion of the spokes, each nut being tightened to such an extent that all spokes are under substantially the same heavy tensile stress, the combined stresses in all spokes being such as to subject the annular abrasive rim to heavy compressive forces in a circumferential direction when the wheel is at rest and at room temperature, the space between the abrasive annulus and the inner metal annulus and between the inner metal annulus and the arbor hole of the wheel being filled with solidified concrete.

Corrosion Prevention

U. S. Pat. 2,369,640. E. R. Barnum, assignor to Shell Development Co., Feb. 20, 1945. A corrosion-preventive composition comprising predominantly a substantially neutral vehicle containing finely dispersed a small corrosion inhibiting amount of a free dicarboxylic acid having at least 16 carbon atoms, the two carboxyl radicals of said acid being linked through an ether group which is joined to an alpha or beta carbon atom.

Corrosion Prevention

U. S. Pat. 2,369,641. E. R. Barnum, assignor to Shell Development Co., Feb. 20, 1945. A solid metal corrodible by salt solution coated with a corrosion-preventive film formed by a free dicarboxylic acid having at least 16 carbon atoms, the two acid radicals of said acid being linked through an ether group not further removed from the carboxylic radicals than the beta carbon atoms.

Flowing Tin Deposits

U. S. Pat. 2,369,748. J. S. Nachtman, Feb. 20, 1945. Improvements in the plating of metals which comprise electrolytically depositing a coating of tin on a ferrous strip, and then continuously passing the metal coated strip through the vapor of a petroleum hydrocarbon having a boiling point above the melting point of tin until the coating of tin is raised to a temperature above its melting point by condensation of said hydrocarbon vapor on the tin surface.

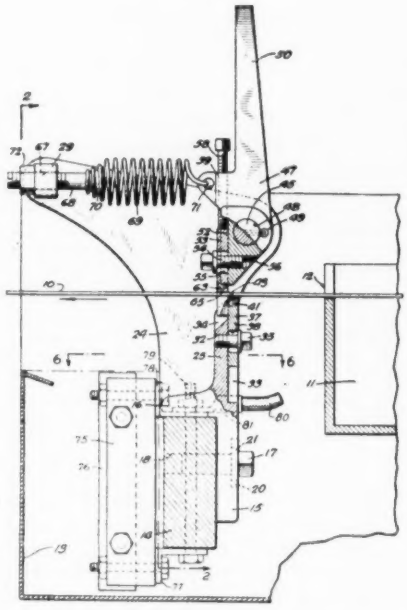
Corrosion Prevention

U. S. Pat. 2,369,946. J. M. Cohen, Feb. 20, 1945. A liquid composition for depositing a protective film upon metals, comprising a base and a volatile solvent therefor; said base having as the major ingredient thereof 75 parts by weight of a substantially neutral semi-solid polar fatty compound of unctuous consistency and of cation properties and having the acid portion of the molecules thereof essentially consisting of a water-insoluble aliphatic acid with at least substantially 16 carbon atoms in the carbon chain, and also including about 5 parts of a water-insoluble higher aliphatic acid with 10 to 20 carbon atoms in the aliphatic chain whereby the said higher acid is compatible with the animal fat, and ½ to 5 parts of a tertiary amine present in an amount for preventing far-reaching direct esterification of the said higher acid.

Bimetal Bond

U. S. Pat. 2,370,108. R. D. Pike, Feb. 20, 1945. The method comprising integrally bonding a non-ferrous metal to an iron base and forming a composite unit capable of withstanding hot and cold working without separation, comprising removing scale from said iron base, subjecting the latter as an anode to electrolytic action in a hot alkaline bath having a temperature not exceeding approximately 200° F. at a current density of about 4 amps. per square foot for 5 to 10 minutes until a loosely adherent film of iron oxide is produced on the iron base, mechanically removing said film from the base, etching the so-treated iron base by treating said iron base with acid, as an anode, to prevent hydrogen formation on the surface thereof, and depositing by electrodeposition an integrally bonded coating of a non-ferrous metal on the iron base.

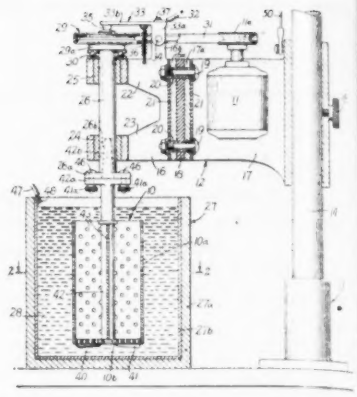
Wire Plating Contact



U. S. Pat. 2,370,420. V. A. Rayburn, assignor to Western Electric Co., Inc., Feb. 27, 1945. In an apparatus for the electrolytic treatment of wire, means for wiping and supplying electrical current to wire comprising a conductor bar, means for impressing an electrical potential upon the conductor bar, a support mounted on the conductor bar, a contactor secured to the support, a lever pivotally mounted on the support, and a second contactor secured to the lever and cooperating with the first mentioned contactor to wipe the wire and supply an electrical current thereto.

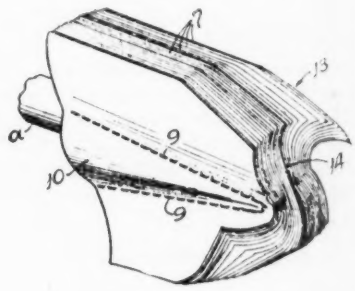
Bulk Anodizing

U. S. Pat. 2,370,463. W. W. Herrick, assignor of 25% to P. W. Whittlesey and 25% to B. Blair, Feb. 27, 1945. In a process for anodizing a multiplicity of aluminum articles, the steps of loading a cylindrical metal container with the articles to be anodized, connecting the container to the anode of an anodic treatment with bath, and rotating said container in the anodic bath with sufficient



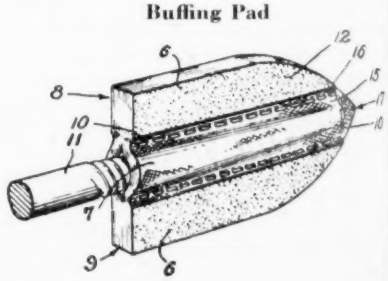
speed to utilize centrifugal force solely to cause the articles to establish firm electrical contacts with the side wall of said container and with each other and to hold said articles in set positions during the period of anodic treatment.

Buffing Pad



U. S. Pat. 2,370,490. G. D. Rice, Feb. 27, 1945. A buffing or polishing pad composed of a multiplicity of plies of flexible material such as cloth fastened together along a central longitudinal axis and adapted to be mounted upon a rotatable mandrel, said plies providing wing portions projecting radially outward from said axis substantially equidistantly and adapted to bend reversely when carried into engagement with a work-piece upon the unidirectional rotation of the mandrel.

Buffing Pad



U. S. Pat. 2,370,491. G. D. Rice, Feb. 27, 1945. A multi-ply abrading pad comprising a plurality of flexible plies assembled in a stack, each of said plies having an abrasive facing on one side only, and means securing the stack of plies together along a central axis to provide oppositely disposed wing sections projecting radially from the axis and in a common plane therewith.

(*Continued on page* 169)

AE CLEANER

FOR YOUR ALUMINUM CLEANING WORK

A low pH cleaner, equipped with synthetic emulsifying and wetting agents. Designed and used for both still tank and electrocleaning of aluminum.

AE cleaner is safe, efficient and economical. It does not attack the metal when used at high concentrations and high temperatures.

Cowles

TECHNICAL SERVICE ON REQUEST

THE COWLES DETERGENT CO.

METAL CLEANER DEPT.

7016 EUCLID AVENUE • CLEVELAND 3, OHIO

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Anodizing

Question: As engineering consultants, we are interested in obtaining information concerning the process of anodizing aluminum aircraft parts.

We shall appreciate having a reprint of P. P. Mozley's article in *Metal Finishing*, *39*, 301 (1941), if available; also reprints of any other articles pertaining to this subject.

Please furnish us with a list of the manufacturers of equipment suitable for this process.

A. E., Inc.

Answer: We would suggest that you obtain a copy of Army-Navy Aeronautical Specification, AN-QQ-A-696-a—Anodizing.

Some details on chromic acid and sulfuric acid anodizing will be found on pages 31-41 of the 1944 edition of the *Plating and Finishing Guidebook*.

We are attaching a list of manufacturers of anodizing equipment from our "Metal Finishing Buyers' Directory".

Tear sheets of Mr. Mozley's article are enclosed.

Polarization of Anodes

Question: When I plate flatware—as usual at 1 volt—the voltage is firm for about 10 to 15 minutes. After that time the voltage goes up to 2 or 3 volts and the amperes disappear entirely. Then I notice that the anodes are blackish. After I move or clean them, the voltage returns to the proper value and the anodes also are of bluish color. I believe the solution is not in proper condition. Is that the case?

V. R.

Answer: Polarization of your anodes, which is the cause of the voltage going up and the amperes dropping to zero, is generally due to insufficient cyanide.

It is suggested that you have this solution analyzed to see whether or not it is out of balance.

Bulk Burring

Question: "In the June 1944 issue of *The Tool Engineer* an article appeared entitled 'Mass Manufacturing for Interchangability.' It mentioned that all steel parts produced by Plymouth are tumbled. A fine even radius and finish being thus developed at great savings over hand filing, polishing and other conventionel methods. At our plant, we do a good deal of hand burring. I would like to know if the tumbling method is adaptable for burring of finished metal parts. We are interested, primarily, in a better means for burring work after it comes off the automatic turning machines."

T. N. R. B., Inc.

Answer: In connection with the former, we would advise that bulk burring is being employed very successfully in countless instances. We are attaching hereto tear sheets of pages 22-3 of our 1944 *Buyers' Directory*, which lists suppliers of barrel polishing equipment suitable for bulk burring.

Determination of Cleanliness

Question: How do you test metal parts to tell whether or not they are chemically clean?

O. Mfg. Co., Ltd.

Answer: A number of tests have been offered for the determination of the cleanliness of articles to be plated. The usual test, however, is the absence of water breaks, and in addition, the adhesion of the deposit can be tested by bending some samples or by striking with a hammer after plating.

Anti-Tarnish Solution

Question: I am interested in finding out if there is an anti-tarnish solution for silver plated objects. If so please furnish details of procedure pertaining to same.

C. J. A.

Answer: The use of a reducing agent in acid medium has been patented for this purpose (U. S. Pat. 2,117,657). An example of such a solution is as follows:

Stannous chloride	1 g./L.
Sodium chloride	2 "
Hydrochloric acid	6 cc./L.

Immerse the silver plated articles at room or elevated temperature for five to ten minutes, rinse and dry. No solution gives permanent protection and the silver must be tarnish-proofed each time it is used.

Other solutions which have been used for the purpose are as follows:

1. ¼ oz./gal. flake soap used in the final hot water treatment.
2. Immersion in a solution of 12 oz./gal. sodium dichromate.

Finishing Buckles

Question: We are engaged in the manufacture of steel buckles for clothing, luggage, dog collars, etc., and should like to have whatever assistance you can give us in solving our finishing problem. Formerly we nickel plated most of the items.

During the period of the national emergency we have been limited by W.P.B. regulations in the finishes we could furnish on our products to black oxide and zinc. These finishes have never been quite satisfactory from a corrosion resistance angle and in many cases were not acceptable by the market.

S. W. P. Corp.

Answer: Domestic silver may be employed for this purpose, also lacquers and enamels.

We do not believe that any non-precious metals, aside from zinc and lead, would be permitted for this type of article.

Bulk Cleaning

Question: Please tell us in your opinion the best methods for cleaning small metal parts in bulk.

We presently perform this operation in oblique barrels, using warm cleaning solution which we change after each batch. (Cleaning time: 20 minutes; Load: 100 pounds.)

If there is a more efficient method we would appreciate receiving your comments.

O. Mfg. Co., Ltd.

Answer: A more efficient method for cleaning metal parts in bulk than your present one, is to degrease in trichlorethylene or tetrachlorethylene, after which, the articles may be tumbled in a horizontal cleaning barrel for five minutes.

Such barrels are similar to plating barrels except that the cylinders are of steel or monel constructions, and have no electrical connections. They are obtainable from manufacturers of horizontal plating barrels.

Chromium Plating Brass

Question: I would like some information in regard to plating chromium direct on the nickel tank in order to eliminate buffing the nickel before chromium plating. The kind of work that I am planning on plating is brass plumbing fixtures.

A. J. H.

Answer: A bright nickel solution will be suitable for this purpose. If only a light nickel is required, a cold solution with addition brightener may be employed.

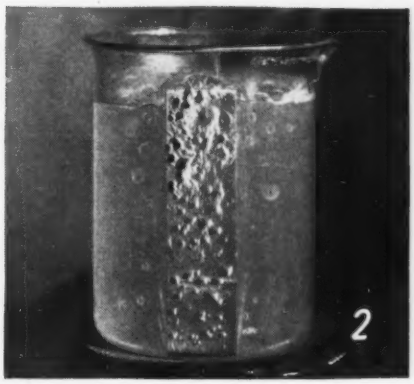
If heavy nickel deposits are required, it would be necessary to use a hot bright nickel solution, since the cold bright nickel will have a tendency to crack on the edges.

Information on both of these solutions may be obtained from your local plating supply house.

(*Continued on page* 18

Now... ALUMINUM
Identification Markings Easily Removed

Here's Proof that DIVERSEY D-C No. 36 completely removes identification ink, dirt, heavy grease *faster*. No white film. No corrosion. 100% free rinsing. Just make this simple test . . .



1 Aluminum test strip with identification marks and heavy coating of oil and grease.

2 Place test strip for 3 minutes in boiling solution of DIVERSEY D-C No. 36.

3 Remove from solution and rinse. Note clean surface . . . absence of "waterbreaks" proving complete removal of oil and grease.

EXPERT HELP ON METAL CLEANING

If you need help on any metal cleaning . . . or working . . . problem, just call for the DIVERSEY D-Man. Backed by a Research Laboratory that has spent 18 years developing special purpose products, he is always on deck to lend a helping hand . . . often finds ways to step up production with less manpower.

DIVERSEY D-MAN

Aluminum Comes Clean as a Whistle with DIVERSEY D-C No. 36

Thanks to DIVERSEY D-C No. 36, you can now clean aluminum surfaces of stubborn identification markings, heavy coats of drawing oil, and grease quickly and easily . . . in preparation for anodizing, welding, painting or matte finishing. And there's no risk of staining, pitting or corrosion . . . or of damaging even the thinnest cladding.

Repeated laboratory tests and extensive use in the field prove that this remarkable cleaner removes surface dirt, oils, and inks in a fraction of the time required by any other method. For example, inks only partially removed in 10 to 15 minutes with ordinary cleaners have consistently been removed in 4 to 5 minutes with D-C No. 36 . . . in *still tank* solution!

Excellent cleaning with D-C No. 36 is largely due to carefully determined wetting and emulsifying properties. Economical operation is assured by superior water softening action . . . clear solutions being obtained even in hard water where large amounts of additional water are introduced during the life of the solution. And free rinsing will conform to the most rigid specifications.

Get acquainted with D-C No. 36 . . . the faster, better, more economical aluminum cleaner. For a liberal experimental sample, write to: Metal Industries Department.

THE DIVERSEY CORPORATION
53 West Jackson Boulevard, Chicago 4, Ill.

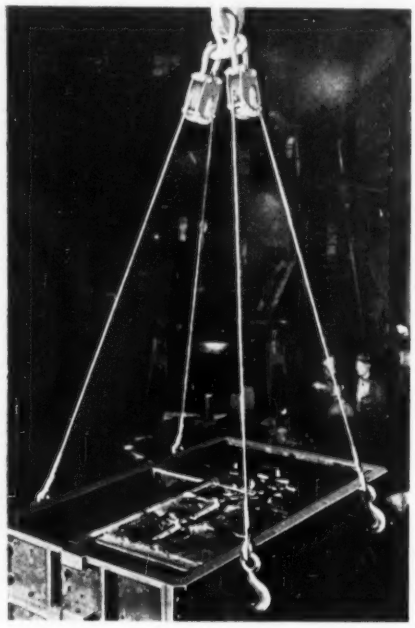
NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Level-Lift Slings

The complete line of Macwhyte Caldwell "Level-Lift" Slings, all patented, are now made in ¾ ton, 1½ ton, 3 ton, and 6 ton capacities. Formerly made only in 3 ton and 6 ton capacities, increasing demands for smaller units led to the addition of two new sizes, ¾ ton and 1½ ton.

The operation is simple. After the lightweight block containing wire rope is put on the crane hook, the crane operator spots the crane hook over the approximate center of gravity of the load and the floormen attach the sling to the load.



The crane operator then applies the power to lift the load, and as the crane hook is lifted, the rope automatically adjusts itself through the "Level-Lift" block. In so doing, one sling leg of rope becomes longer than the other, and as the weight of the load pulls on the wire rope, the sheave in the block pulls down against a brake which prevents slippage. The load is then lifted level.

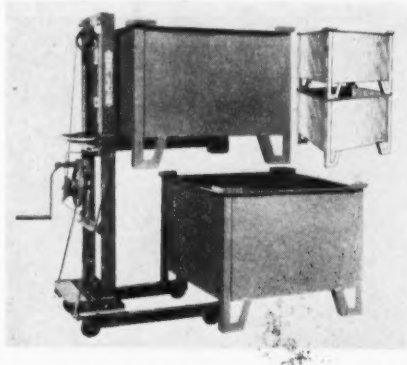
Should the crane operator not get the block and crane hook close enough to the center of gravity of the load, it is only necessary for the operator to lower the load enough to relieve tension on the sling which releases the brake and then move the crane hook over a little to the true center of gravity. On applying the power, the ropes readjust themselves and the load rises level.

For complete information, Macwhyte Co., Dept. MF, Kenosha, Wisc., will be glad to send a copy of Folder No. 44-71 which shows complete specifications and pictures of the sling in use.

All-Steel Storage Bin

(Stacking Type)

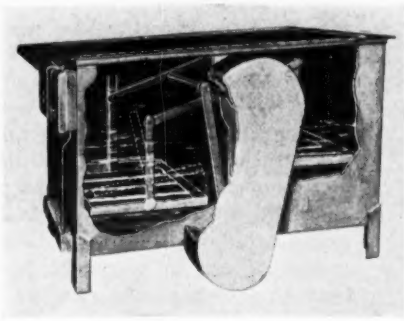
This bin was especially designed for a large metal working plant to be used for handling small parts in course of production.



Corner plates allow for convenient stacking and storage. Four-way entrance permits pick-up from any one of four sides. May be handled with hand or power lift truck or fork truck. Can be tiered with portable elevator, high lift or fork truck. Made of heavy steel plate with legs and corner reinforcements of angle iron. Detailed description sent on request to the manufacturer, Palmer-Shile Co., Dept. MF, 7124 West Jefferson Ave., Detroit 17, Mich.

Two Stage Surge Washer

This new development in the line of Phillips Metal Cleaning Machinery is designed to provide economical washing for smaller parts in baskets, using an emulsion cleaner (or alkali cleaner) and water rinse. In construction the unit comprises two compartments with a dividing, insulated wall between. One contains the cleaner, the second the water rinse. The mechanism is reciprocating in action, moving the rack on which



the basket rests up and down through the cleaner and rinse, and accommodates two baskets at one time—one being swished through the cleaner while the second is being swished through the rinse.

This reciprocating cycle moves the baskets

Professional Directory

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NATIONWIDE, COMPLETE CONSULTING SERVICE FOR THE METAL FINISHING INDUSTRY.
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20 YEARS IN FIELD
MEMBER A.E.S.
RE-CONVERSION AND PREPARATION FOR PEACE-TIME PRODUCTION: — SPECIALIZATION

A Fine Finish for your products . . .

WHEN BASKETS ASK NO FAVORS!

Roughly handled over a long period in a variety of pickling acids, these welded Monel baskets are still giving good service.

Lightweight Monel equipment resists corrosive attack of pickling solutions

Hardly anyone would say these pickling baskets *look* impressive.

However, they make up in *performance* for what they lack in *appearance.*

Made of Monel, the baskets handle a wide range of small brass and steel parts—as much as 100 pounds at a time—prior to cadmium or zinc plating.

Sulfuric acid and hydrochloric acid are used for pickling and cleaning.

Monel resists these corrosives, even when concentrations vary and temperatures frequently run as high as 180° F.

In addition, Monel is strong and tough . . . can take a lot of slamming around. When baskets get bent and battered after long, hard service, you just hammer them back into shape . . . save repair bills, time losses and tempers.

Pickling baskets . . . as well as crates, racks, chains, hooks and accessories . . . can almost always be made of standard mill forms of Monel.

Requiring no special fabricating techniques, Monel equipment is economical and requires little maintenance.

MONEL

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK 5, N. Y.

NICKEL (INCO) ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL

Sheet . . Strip . . Rod . . Tubing . . Wire . . Castings . . Welding Rods (Gas and Electric)

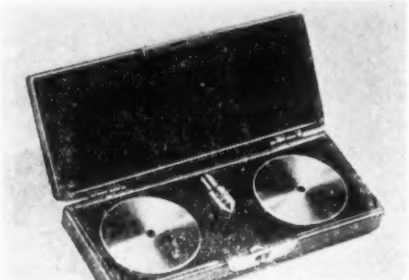
vertically through the solutions; from total immersion to total emersion, producing the maximum of agitation for the removal of chips, soil, etc., not readily removed by simple cleaning. Either surge platform will accommodate basket loads of 50 lbs., operated singly or together. The machine is 40" long by 21" wide. Each tank holds 16½ gallons of solvent or water and each surge platform takes baskets 14" square by 6" high. The reciprocating action is powered by a 1/3 H.P. motor and the machine is offered in four models: unheated, with heated solvent tank, with heated rinse tank, and with both tanks heated. Heated tanks are provided with automatic thermostatic controls which keep the temperature of the solution to within plus or minus 5° F. The water rinse tank provides for overflow and can be fitted with a flow control valve. It can thus be unheated, utilizing the supply of hot water where present or be heated where hot water is not readily available. The surge washer is also provided with a hinged cover which locks into position as a draining board to drain the solvent back into the tank before baskets are placed into the rinsing compartment.

Further details and prices may be obtained by writing to Phillips Manufacturing Co., Dept. MF, Touhy Ave., Chicago 45, Ill.

Diamond Checking Set

A Master Diamond Checking Set is now available for checking the accuracy of hardness testing equipment. A product of Clark Instrument, Inc., it can be used on all Clark Hardness Testers and other instruments used for "Rockwell Testing".

The set consists of a gold-plated diamond



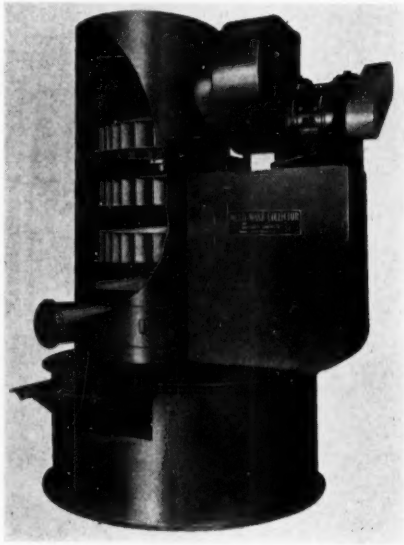
penetrator and two test blocks. The penetrator is carefully made to exceedingly close tolerances to give the highly accurate measurements required for checking readings. Since it is designed to be used only for checking purposes, it retains its original accuracy for a long period of time. When checking, the master diamond penetrator replaces the regular penetrator in the machine.

The same is true of the two master test blocks. Held to extremely close limits, they are used only in connection with the master diamond. The resulting combination furnishes a very accurate check of the machine, either as a periodical measure or whenever readings may be in doubt.

The Clark Master Diamond Checking Set is furnished ready for use in a fitted case. Further details are available from Clark Instrument, Inc., Dept. MF, 10200 Ford Road, Dearborn, Mich.

Dust Collector

Many plants have isolated dust-creating operations which cannot conveniently be served by a central dust collecting system. The dust arising from these grinding, milling,



conditioning and other processes takes a serious toll in lowered working efficiency, undue wear on motors and operating equipment, contaminated product and reduced output. To meet such requirements, the self-contained dust collecting unit pictured has been developed.

The Schneible Type "EC" Multi-Wash Collector combines in a single compact, portable self-contained unit all of the functions of the larger central dust and fume control system. The equipment consists of a three and one-half impingement stage multi-wash dust collector, a suction fan, a sludge settling tank, a recirculating pump, a sludge settling tank and an after-filter. The unit operates with the same high efficiency as larger multi-wash equipments, which are used by many of the most widely known industrials of America. "EC" units are available in capacities of from 400 to 5,000 cubic feet of air per minute.

This collector is designed to function indefinitely with but little attention and with a very minimum of maintenance. There are no bags, screens or filters to require cleaning or replacement. There are no parts to rapidly wear, clog, burn or become inoperative. The collected matter, as sludge, is disposed of more easily than an accumulation of dust.

Bulletin No. 145 on the "EC" Collector will be mailed on request by the Claude B. Schneible Co., Dept. MF, 2827 Twenty-fifth St., Detroit 16, Mich.

Voltage Controllers

For voltage control of small power applications, Superior Electric Co. Dept. MF, of Bristol, Conn. announces the new 116 and 216 Powerstats. This addition to the standard line was developed to meet the demand for a compact, lightweight, and ruggedly constructed variable transformer in the 1 KVA range. Possessing the highest output current rating for equivalent panel mounting dimensions of any competi voltage controller, these new models h features found in no other variable tr former of comparable size. An extra l aluminum brush heat radiator is combi with a new type of brush pressure adj ment spring to assure a low brush temp ture rise and reduced probability of dam from sudden over-loads. Through ingeni design of core and coil and use of aluminum mechanical construction, Po stats 116 and 216 have a total weight only nine pounds. Included in this we is a protective screening and totally encl terminal box with input cord and plug, outlet, and an "on-off" switch. When th units are supplied less screening and term box, they weigh only 7.5 pounds. De nated as "U" types the uncased mod are intended primarily for rear of pa mounting. Convenient connectors on a ba lite terminal strip provide for easy instal tion in any low power circuit.

Powerstat 116 operates on a single ph 115 volt input to deliver a variable out voltage from 0—135 volts with 7.5 amp available at any brush position. Model 2 has twice the voltage rating and a curr rating of 3.0 amperes. By mounting t single units in tandem, different volta and current ratings are obtained. Circ diagrams and other technical data is lis in bulletin No. 116.

Waterproof Miniature Meter

For the first time in the history of t electrical industry a hermetically sea ring-mounted miniature 1½" meter, Mo 120, has been developed by the DeJur-Am

Corp., Dept MF, Northern Blvd. and St., Long Island City 1, N. Y.

Built to A.S.A. specifications, the DeJ Model 120 is the smallest meter availab capable of performing a full-scale task in variety of applications, present or post-w

Hermetically sealed, the miniature mo can be immersed in water at a depth of 5 feet, for as many as seven days without ha to its mechanism. In mounting, the fla is sealed to the panel by a gasket.

The case including the terminal studs completely waterproof; thus, if the gl breaks, the equipment remains waterpro The DeJur Model 120 instrument is ther fore ideally suited to equipment which m sustain immersion. Built of corrosion res

materials, the meter has a black anodized sh.

The instrument flange may be mounted on thickness panel between 1/16 and ¼ n inch, steel or bakelite. A waterproof ket is supplied with the Model 120 for ing to the panel.

The DeJur Model 120 is ring-mounted for installation, which eliminates the need mounting holes or screws. It is available wide variety of ranges including highly sitive microammeter or microvoltmeter cifications.

Expertly engineered for accuracy, rugged- and submersion, the 1½" miniature odel 120 meter is an ideal component for all equipment.

Water Soluble Buffing Compounds

After several years of research and ctical demonstrations, a line of buffing pounds have been developed that are pletely water soluble. E. Reed Burns fg. Corp., with plants in Brooklyn, N. Y. Middlesex, N. J., announce two lines buffing compounds now in production with water soluble feature.

This advantage is made possible by the of some of the new types of wetting nts which cause the usual type grease d to become completely soluble in water se to the boiling point, eliminating the of strong cleaners, long soaking and ual scrubbing operations.

In the jewelry and silverware field, a cial coloring rouge for both gold and er has met with almost instantaneous eptance. This grade is made of the finest tainable domestic oxides and will produce high, brilliant, scratchless luster. It will sh out of recessed and filigree parts hout soaking or scrubbing, in plain water about 200° F. This grade is No. 7WS, is in cake form, packaged in a car- 7½" x 2½" x 1½".

The same principle has been applied in production of tripoli compounds for ing down all types of non-ferrous tals.

These grades are made of pure tripoli r, with the grease binder treated the e as in the case of the Red Rouges. ere have been several grades so far de- oped, one for brass, where a dry, high oring compound is required, and others ere a heavier cutting, more moist grade needed. These grades are furnished in proximately 3½ – 4 lb. tubes. The dry de is No. 8WS TRIPOLEX, and the er cutting grade is No. 15WS.

Further information and samples can be upon request to the company's main ce, Dept. MF, 40 Withers Street, Brook- 11, N. Y.

Abraser

An improved Taber Abraser designed manufactured by Taber Instrument p., North Tonawanda, N. Y. is now ilable in a complete Testing Set as an- nced by this company. The Testing Set ludes a Taber Abraser, with all acces-

"HOW CAN WE IMPROVE OUR POLISHING?"

"BY USING THE RIGHT SIZE OF LIONITE!"

Using the correct abrasive grain in your polishing operation not only reduces costs but means a better job. The proper size grain is most important. Many polishing operations take unnecessary time and produce work not quite up to specifications because the correct grain size has not been used.

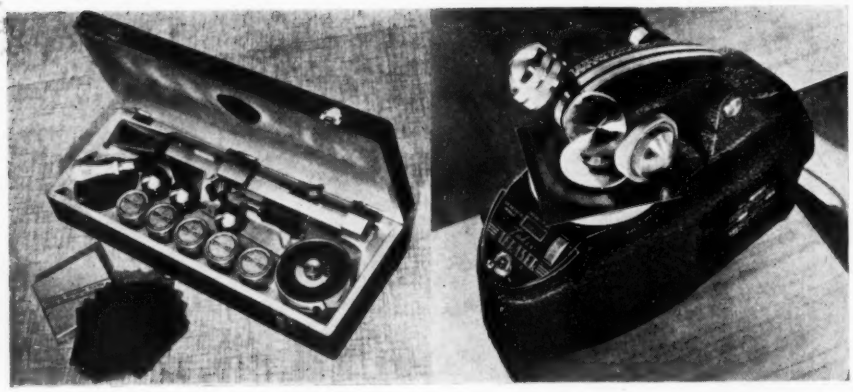
Ask a LIONITE representative to check your polishing operation. Whether you are a LIONITE user or not, he will be glad to recommend the grain size best suited to the job. Many users have had their polishing production increased and the quality of the work greatly improved by following the recommendations of a LIONITE representative.

Write or call for one of our engineers to check your operation. Their services are without charge or obligation.

GENERAL ABRASIVE COMPANY, INC.
NIAGARA FALLS, NEW YORK, U. S. A.

LIONITE GENERAL ABRASIVE CO. NIAGARA FALLS, N.Y.

LIONITE and CARBONITE
Abrasive Grains



sories, together with a Specimen Table for running tests under wet or moist conditions. An Illuminated Magnifier for the inspection and examination of specimens is part of the Set.

The Taber Abraser is being used by hundreds of manufacturers for determining the wear or abrasion resistance of practically every material subject to surface abrasion. The complete Testing Set as now available, will find a long felt need in the laboratories of those companies seeking research data on the wearing qualities of their own or competitive products.

The wearing action of the Abraser is performed by dual Calibrase wheels bearing against the specimen under constant pressure, revolving in opposite directions, one sliding radially toward the outside and the other sliding toward the inside of the wear path. Each wheel revolving at a steady constant speed through contact with the specimen exerts a combined abrasive, compressive and twisting action twice in each revolution of the specimen holder. Because the Specimen Holder travels a complete circle, the wear due to differences of grain or weave is fully revealed. A standardized load adjustment is provided for varying the pressure of the Calibrase wheels against the specimen so the abraser will test both delicate and tough materials with equal precision.

The Taber Abraser is self-contained and ready to operate by simply plugging into an electric line. The results of tests are reported either as the number of "Wear Cycles" or as "Loss in Weight" when weighed on a precision laboratory balance.

Complete information on the Taber Abraser Testing Set is available by writing Taber Instrument Corp., 111MF, Goundry St., North Tonawanda, New York.

Spray Cleaning

N. Ransohoff, Inc., Dept. MF, Cincinnati 16, Ohio is now manufacturing monorail and conveyor type spray cleaning machines to apply phosphate coating on metal parts prior to painting so as to provide better adhesion between the metal surface and the paint.

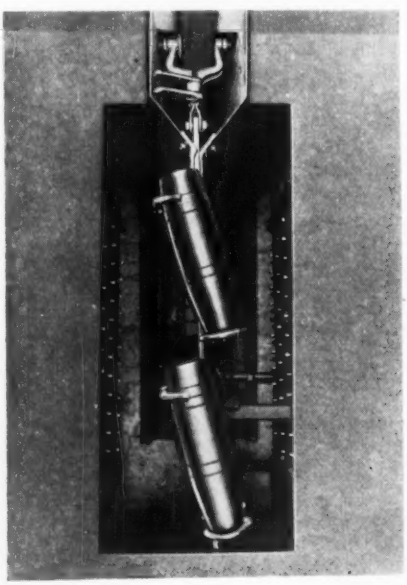


Illustration shows the monorail type, 3-stage spray washer for 105 mm shells.

The shells are hung on racks so constructed that they are sprayed both inside and out and are carried at a slanting angle to permit drainage. The machines are designed to fit into the overhead monorail systems already installed in some ammunition plants but are also designed with a self-contained monorail if desired. The machine shown is one of 7 now being installed in a large ammunition plant.

Machines are equipped with the patented Ransohoff Packless Pumps.

Although the machines are now doing yeoman work in handling heavy ammunition shells they will find wide application in the post war period as they can be constructed to carry metal parts of almost any size.

High Speed Plating Machine

Joseph B. Kushner, Metal Finishing Engineer, 233 W. 26th St., N.Y.C., announces the development of a new process and machine for high speed plating of wire, metal ribbon and the like. Based on new techniques, the machine and process for wire plating, is capable of handling wire from .0025" thick up to light cable at speeds ranging from 150 to 750 feet per minute with breakage reduced to an absolute minimum. The deposits can be made to close tolerances as regards weight and thickness. The overall length of the machine may run from 18-36 feet depending on the weight of metal to be deposited and the electrol treatments involved. For example, a mach capable of plating a 2% by weight dep of gold on fine silver wire at a speed 300 feet per minute is only 22 feet lo The machine can handle 12 lines of wire a time and is approximately 30 inches wi All plateable metals such as silver, zinc, t etc. can be handled and plated out by machine. It is highly compact and easy operate, working as it does from one m switchboard control station.

In another variation, the machine can pl small metal parts such as radar parts to 40 msi gold or silver specifications at h high rates as to offer definite advanta over barrel plating techniques, in view the uniformity of deposit, close toleran and minimum labor requirements involv High speed zinc plating of small steel pa brass plating of electrical parts, gold pl ing of costume jewelry in mass product and high grade finishes, are a few of t many possibilities offered by the machine process. Applications for patents have b made. Inquiries with regard to war and p war uses and applications of the machine process are invited.

Face Shields

Four new face shields which provide lig duty protection on operations such as m sawing, acid handling, buffing, sanding light grinding are announced by the Am can Optical Company, Dept. MF, So bridge, Mass. Also announced are th types of button-on windows for the shiel clear cellulose acetate for general purpo 24 mesh screen for heat protection; and th with a filter glass window for welding scarfing.

The new face shields are light, comforta and sturdily made to withstand hard u Due to their design, they may be worn w out discomfort by workers who wear p scription glasses. All the parts are ea interchangeable—facilitating handling, st ing and assembling.

The new AO F-100 face shield has adjustable elastic headband which may worn low on the head for additional c fort. Genuine leather sweatbands, like windows, button on and are easily remo Fibre headpiece holds the device comforta and firmly on the head. Shield may be stantly thrown up when not in use—and held securely in position by friction joi Removal of pivotal nut, spider and wa permits instant interchanging of parts.

The F-200 shield is the same as the F but in addition it is fitted with a stand spark deflector (or forehead guard) for e protection.

The F-300 shield is identical to the F with the exception of the back headba which is of fibre construction, styled to fit lower head snugly and comfortably, a important feature. The long band sli within a fibre sleeve in back, permitting adjustment to varying head sizes and p venting hair pulling. Adjusted by a kn nut turning on a right and left hand thre stud.

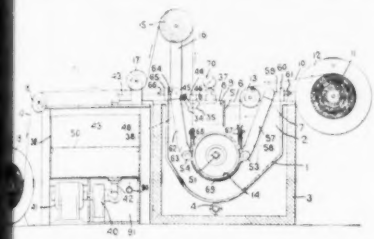
The F-400 shield has all the features the F-300 shield plus a full spark or h deflector.

PATENTS

(*Concluded from page* 160)

Hot Dipping Machine

U. S. Pat. 2,370,495. H. Sebell, assignor of half to A. H. Parker, Feb. 27, 1945. An apparatus for coating sheet metal comprising a pot containing a bath of molten coating metal, said pot having an oil-containing compartment at the delivery end thereof, means to feed a strip of sheet metal through said bath and through the oil compartment, means to deliver a sheet-like high pressure jet of



oil against the coated surface of the sheet metal while it is traveling through the oil compartment, thereby to wash surplus coating metal from the sheet metal, means to supply heat to the oil in addition to that which it receives from the molten coating metal, and means to supply heat to the sheet metal in addition to that which it receives from the molten coating metal, the additional heat thus applied to both the oil and the sheet metal serving to maintain the coating metal which adheres to the sheet metal at a temperature at which it is in a sufficiently free-flowing condition so that the air jet will wash all surplus coating metal from the sheet metal and leave thereon a thin coating of uniform thickness.

Electroplating Control

U. S. Pat. 2,370,621. T. R. Freitag and E. Freitag, Mar. 6, 1945. Timing apparatus for direct current service comprising a normally open line switch; a direct current operated solenoid adapted when energized to effect closing of said line switch; a control system for the said solenoid embodying therein a direct current operated starting relay switch and an alternating current operated relay switch connected in series with said solenoid; a source of alternating current and a circuit from said source for operating said alternating current relay; a synchronous timed switch in said circuit and energized from said source; interconnected manually operated switches in series with the operating circuit of said direct current relay and said alternating current circuit respectively and simultaneously operable to condition the circuit of the direct current relay for operation and close said alternating current circuit at one point; additional switch means in the circuit of said direct current relay adapted when actuated to closed position to energize said direct current relay; said timed switch being responsive to the setting thereof for a selected time period to close the circuit to said alternating current relay at a remaining point, maintain it closed for such time period and then to open said circuit whereby when said interconnected switches are closed and said direct current relay is energized the setting of said timed switch effects closure of said line switch for said selected time period.

UNICHROME*

COATING 202

Gives Extra Protection in Strong Plating Baths

With Unichrome Coating 202 on your racks, even the toughest solution won't get to first base. Especially durable when force dried, it sticks to plating racks and fixtures *longer*—resisting even severe anodizing baths and strongly alkaline solutions. What's the reason? It's formulated of special resins that have shown maximum chemical resistance under actual shop conditions.

And although these resins are in great demand for other war uses today, there's been no change whatever in our formula. So start using this current-saving insulation now. Write for prices or a trial order.

* Reg. U. S. Pat. Off.

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PROPERTIES

Chemical Resistance—Excellent for all plating cycles.

Toughness—Withstands repeated flexing and shop handling—cuts cleanly and easily at contacts.

Drying—Dipped at room temperature in container in which it is shipped—force dried at 200°F. for extra protection.

Adherence—Excellent for severe cycles. For moderate cycles "Air Dry" Coating is recommended.

TRY THESE OTHER UNICHROME MATERIALS

Unichrome "Air Dry" Rack Coating—a rack insulation that can be dipped and dried at room temperature, for use in all plating solutions

Unichrome Quick Dry Stop-Off 322—for cyanide copper and other plating work requiring an extremely adherent stop-off

Unichrome Quick Dry Stop-Off 323—for chromium and other plating work requiring a stop-off that can be peeled off after use.

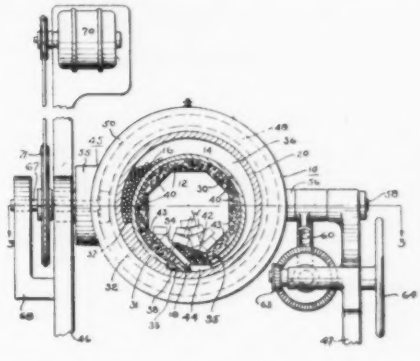
Unichrome Resist—a solid insulating material for constructing composite racks, stop-off shields, insulating gaskets, etc.

Vitreous Enamel

U. S. Pat. 2,370,695. P. C. Stufft, assignor to Pemco Corp., Mar. 6, 1945. The method of producing opaque zirconium opacified frit comprising introducing zirconium opacified molten frit-forming material into a quenching bath maintained at a temperature between 180° F. and 205° F., whereby there is produced a frit characterized by uniform opacity, said frit maintaining its uniform opacity and covering power upon firing and refiring.

Tumbling Barrel

U. S. Pat. 2,370,792. F. C. Hoffman, assignor to General Motors Corp., Mar. 6, 1945. A rotatable tumbling barrel for tumbling work pieces together with tumbling elements smaller than the work pieces and comprising



a pair of inner and outer hollow members spaced to provide therebetween an arcuate tumbling element chamber peripherally extending more than half of the peripheral distance around said inner member, the inner member providing a tumbling chamber for

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608
Costs Less To Use
Saves Time
BUNATOL No. 608 Stop-Off (at a new low price) is the last word in a high grade Stop-off for use in any strong alkaline plating solution such as Copper or Tin; it really holds on the trimmed edge.
No. 608 is a quick air drying heavy bodied liquid applied by dipping or brushing. It combines remarkable chemical resistance with adhesive qualities so superior that edges can be trimmed to a hair-line; and hold without the plate creeping. It will not tree or plate through; will not etch polished surfaces; will lay over irregular surfaces without bridging.
For selective hard Chrome plating where defined areas must be protected from the deposited metal use the dependable BUNATOL No. 474 Red Stop-Off. For those extreme service conditions No. 608 is indicated for hard Chrome as well as in alkali.
Let BUNATOL 608 or 474 Stop-Off stop your stop-off troubles. Write for complete information or order a trial gallon at once.
NELSON J. QUINN COMPANY, TOLEDO 7, OHIO
BUNATOL 608

both work pieces and tumbling elements, mechanism supporting said barrel for rotation about an axis extending longitudinally through said inner member, and means providing between said chambers and located at one peripheral end of the arcuate chamber a passage which will pass only the tumbling elements between said chambers.

Abrasive Tool

U. S. Pat. 2,370,970. G. F. Keeleric, Mar. 6, 1945. A method of making an abrasive tool, which comprises mounting abrasive particles on a support, electrodepositing metal over the particles and controlling the electrodeposition to build up a deposited layer which overlies the particles and is provided with an integral extension of deposited metal, said extension projecting from the face of the deposited layer opposite to that in which the particles lie, and affixing a tool body to the layer with the extension entering a cavity in the body.

Coating Wire

U. S. Pat. 2,370,973. W. C. Lang, Mar. 6, 1945. The steps in the method of coating wire with the same or dissimilar metal by continuous electrolytic process which comprises passing the wire through a series of electrically connected drawing dies for electrolytically treating the wire while successively subjecting the same to heat treating, cooling, cleaning, pickling and electroplating, and repeating the said steps if desired.

PLATING WITH INSOLUBLE ANODES

(*Concluded from page* 146)

decompose during plating and form po sium sulfate as a by-product. This sul content increases rapidly in the solution must be removed by crystallization o precipitation with barium salts.

Summary

1. In electroplating, a plating solution most stable and conditions are most id when soluble anodes are used, the anode cathode efficiencies being 100%.

2. In a plating solution where the me and other compounds are sulfates, no obj tionable by-products are formed when insoluble anode is used. Metal is depl during plating and sulfuric acid formed.

3. In a plating solution where the me salt and other salts are cyanides, comp and unstable organic by-products are form When plating with an insoluble anode, t decomposition takes place however, u after the free hydroxides in the solution spent.

4. In plating with an insoluble anode s tem of the electrolytic type as shown Figures 1, 2, 4 and 5, when a series el trical hook-up is used, then the generat voltage must be approximately 3 volts hig than required for conventional plating.

When a parallel electrical hook-up is us two generators are required, one for plati and one for regenerating.

5. When plating with a solution of po throwing power it becomes necessary to u conforming anodes in order to produce posits of desired thickness. In this case is justified to use an insoluble anode syst

6. Insoluble anode systems are also us for employing scrap metal as anode materi due to anode shortages.

7. Proper selection of diaphragm ma rial is most important.

(a) Diaphragm material must not be a tacked by the plating solution.

(b) Diaphragm material must not cont undesirable soluble material whi will have bad effects upon the plat deposit.

(c) The wall thickness of the diaphrag must be sufficiently thin and porous offer the lowest voltage drop, yet permit metal ion diffusion, either wh standing idle or during the plati operation.

(d) The diaphragm material must not co tain conducting particles or capill holes. These imperfections will cau local treeing and shorting out.

8. Organic brightener such as carbo disulfide brightener decomposes rapidly in silver cyanide solution using an insolub anode. It was found that an inorgan brightener of the ammonium thiosulfate ty produces best plating, to date, and will n decompose as readily.

9. When a thiosulfate brightener is use the plating solution from time to time m be chilled to crystallize out potassium sulfa which forms as a decomposition product.

Business Items

Arthur R. McNeil

MacDermid Incorporated of Waterbury, Conn., recently announced the appointment of *Arthur R. McNeil* as technical sales engineer for Southern Connecticut.

Mr. McNeil is in his second year as president of the Bridgeport Branch of the American Electroplaters' Society and is a member of The Electrochemical Society.

Mr. McNeil started his career of plating and polishing in the Underwood Elliott Fisher Plant in Bridgeport, leaving there to go to Contract Plating Company in Stratford where, under the expert tutelage of Jerry O'Connor, he became Plant Superintendent. After twelve years at Contract Plating Company, he worked at Bridgeport Thermostat as Finishing Supervisor.

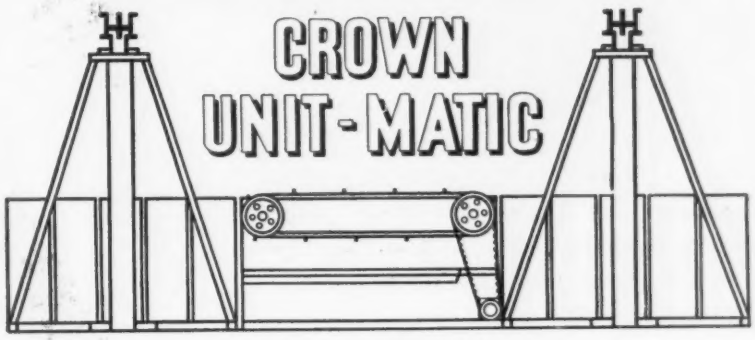
Because of this excellent background, Arthur McNeil is well qualified to service the metal cleaning compounds MacDermid Incorporated manufacture as well as engineer and install complete metal finishing plants.

The *Foxboro Company*, Foxboro, Mass., makers of industrial instruments for measurement and control, announces that *William A. Rock* will be its resident engineer in the Corpus Christi area, under the direction of the Houston office. He has already taken up his new duties. His mail address is P. O. Box 1956, Corpus Christi, Texas.

Mr. Rock has spent most of his life in the Southwest and his business experience has been principally in the instrumentation of oil refineries and gas plants. Through association with some of the leading construction companies serving the petroleum industry he has had extensive practical training in the installing, operation and maintenance of the many types of instruments used in the pro-

Crown

BRINGS TO THE PLATING INDUSTRY THE OUTSTANDING EQUIPMENT DEVELOPMENT DURING THE PAST QUARTER OF A CENTURY



(PATENT APPLIED FOR)

FULLY AUTOMATIC
PARTIALLY AUTOMATIC
EQUIPMENT

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CLEANING
PICKLING

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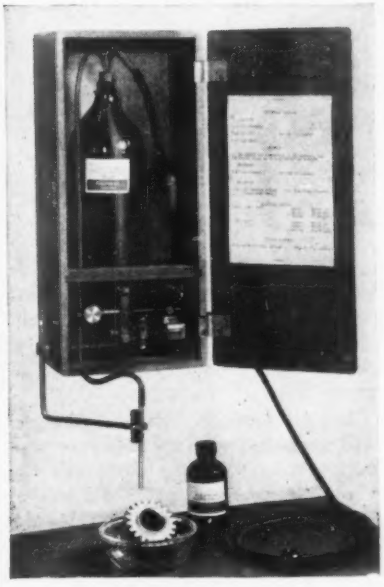
1910 MAYPOLE AVE. CHICAGO, ILL.



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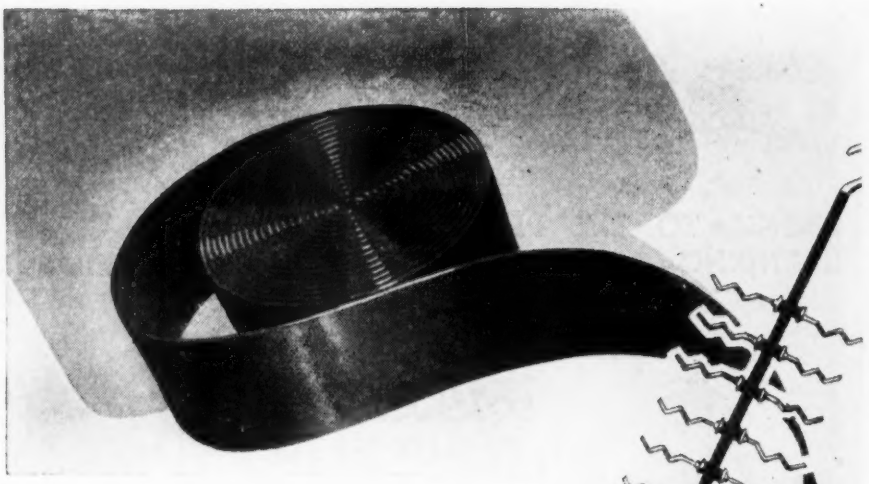


• Built into Tygon Tape are properties which the experience and "know-how" of top platers everywhere, approve. Here is an insulating tape designed to make plating rack protection simpler, more positive.

It has stretch without snap to make application easy, to assure an even, uniform wrapping tension without entrapped air. Its smooth surface does not "wet" easily, lessens dragout. Its excellent dielectric qualities decrease current losses. Its tough, resilient nature resists mechanical abrasion and impact shocks. And its almost "universal" corrosion-resistance provides real rack protection from chemical attack.

Available at your dealers in convenient ¾" wide rolls, or write direct.

TYGON TAPE

U. S. STONEWARE CO.
AKRON, O.

J. J. Duffy, Jr.

called to the Philadelphia Office in 19 to assist *Mr. Wm. P. Drake*, Manager Sales, as Development and Service Engine on the new products of the Special Chem cals Division made necessary by the wa time needs of the industries served by th Division.

In his new capacity, Mr. Duffy will ass Mr. Drake in supervising the activities the Special Chemicals Division's field m

---

The *Civil Service Commission* has a nounced that Metallurgists are needed this time to fill positions in the Bure of Mines, in Naval Shore Establishment and in War Department Arsenals. Th salaries, including overtime pay, ran from $2,433 to $6,228 a year. Most of th positions are at the lower salary levels.

Applicants for the $2,433 positions ma have had 3 years of technical experien in the field of metallurgy unless they re substitute appropriate education. Th higher-grade positions require additional e perience. No written test will be give and there are no age limits.

Interested persons may secure announce ments containing full information regar ing the positions, and application form at the nearest first- or second-class po office or direct from the United State Civil Service Commission, Washington 2 D. C.

Appointments to Federal positions ar made in accordance with War Manpower Commission policies and employment stabi zation programs.

Claude B. Schneible Co., Detroit, manu facturers of "Multi-Wash" equipment fo dust, fume and odor control, has announced the appointment of *John C. Somers, Indu trial Products Engineering Co.*, 1 Hunter St Long Island City, N. Y., as its representativ in the New York territory, including th states of Connecticut, New Jersey an New York.

The Industrial Products Engineering Co

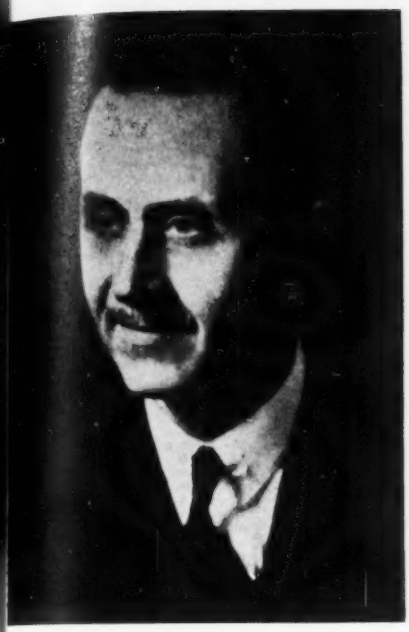
duction and refining of petroleum products.

Mr. James M. Tuttle has joined the staff of engineers attached to the Pittsburgh office of the company, at 5151 Baum Blvd., Pittsburgh 24, Pa.

Mr. Tuttle has a background of experience which will be particularly useful in serving the diversified industries of the Pittsburgh territory. A graduate of M.I.T., he spent several years as an engineer with an industrial construction company, and later conducted his own business as a manufacturers' representative and engineering consultant.

The appointment of *Mr. J. J. Duffy, Jr.*, as Assistant Manager of Sales of the *Pennsylvania Salt Manufacturing Co.*, Philadelphia, Pa., has just been announced by *Mr. George B. Beitzel*, Vice President in Charge of Sales.

Mr. Duffy, a graduate Chemical Engineer, has been associated with the Company since 1937. After completing the Company's Student Training Course in 1939, he was assigned to the Special Chemicals Division and, for the next three years, served as Sales-Service Engineer for that Division in the New York State area. He was then



John C. Somers

engineers and distributes modern industrial plant equipment and materials.

Mr. Somers, a graduate of Carnegie Institute of Technology, has had a broad experience in the industrial field. He is a member of the A.S.M.E., the A.S.T.M. and the Machinery and Metals Export Club. Since 1938 he has been located in Long Island City engaged in sales engineering and representing a number of leading lines of plant equipment.

Mr. Somers is well qualified to represent the Schneible line, which embraces standard units for the control of practically every dust and fume condition encountered in industry. He has adequate experience to engineer equipment for every type of application where the use of wet dust suppression equipment is indicated.

The *Despatch Oven Company* announces the opening of a new Sales and Field Engineering office in suite 1334, La Salle Wacker Building, 221 N. La Salle St., Chicago 1, Ill.

This new Despatch Branch Office was set up to augment the present Despatch engineering staff at Minneapolis, and to offer greater industrial oven and furnace engineering facilities to every manufacturer in the United States requiring such assistance, especially those manufacturers engaged in the production of war goods. *Mr. John H. Watson* is General Manager.

The engineering staff of the new Despatch Chicago Office is considered one of the most outstanding in the nation. Every man has had over 8 years, and some up to 23 years of practical experience in designing ovens and furnaces, and in making plant layouts which incorporate ovens and furnaces as well as such auxiliary equipment as cleaning and washing machines, bonderizing systems, spray booths, air conditioning systems, conveyor systems and the like. Their total experience is just under 70 years, which does not include any draftsmen.

We have a complete line of Aluminum Colors especially prepared for coloring anodic coatings. We shall welcome an opportunity to serve you on your dyeing requirements.

SANDOZ

SANDOZ CHEMICAL WORKS, Inc.

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One of the more serious problems that has always confronted the porcelain enameling industry has been that of overspraying.

Several years ago the *Harper J. Ransburg Co.* of Indianapolis, confronted with this same problem in the application of paints and varnishes, conceived the idea of appyling the principles of electronics to automatic spraying and achieved a major success.

As a result of their success in the application of organic coatings, it was logically reasoned that the possibilities pointed to the success of electrostatic spraying with inorganic materials.

Early in 1944 the *Pemco Corp.* of Baltimore became seriously interested in electrostatic spraying for use in porcelain enameling and determined to find out if the process would be of any value to the industry.

In July of 1944 the equipment necessary for tests and experimentation was set up at the Pemco plant in Baltimore and a clearly defined program, under the supervision of the Pemco Research Division, was put into effect.

The technical data accumulated during these tests definitely proved that electrostatic spraying is satisfactory in porcelain enameling and when properly used a uniformly coated product with the minimum of overspraying is obtained.

Technical matter concerning these tests as well as costs and availability of the apparatus can be secured from the Ransburg Co. in Indianapolis or through the Pemco Corp. of Baltimore.

As part of the expansion program of the Alkali Division of *Detrex Corp.*, Detroit, *Joel N. Cooper*, will transfer from Michigan to the New England states, where he will supervise sales of alkali and emulsion cleaning materials. This promotion becomes effective immediately, according to *L. Camel*, General Alkali Sales Manager.

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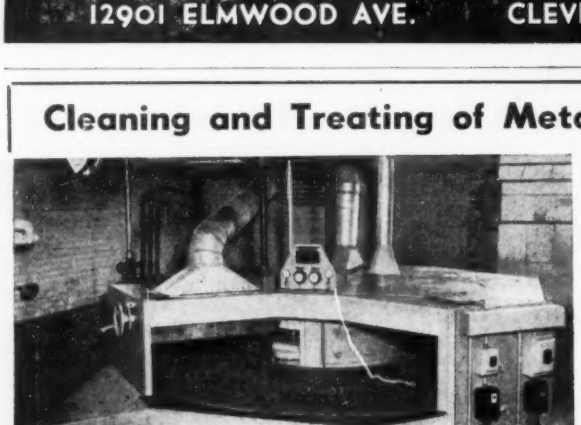
Cleaning and Treating of Metal Parts by one-man-operated Roto-Table Machine



This heavily constructed machine has established an enviable production record. Noted for its simplicity in engineering design, with few moving parts; the work clearance is 40 inches in width and 20 inches high. Turntable functions at various speeds. Handles large or small parts, and is adaptable for a broad type of service. There are several sizes of this machine available.

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We also design and manufacture large or small machines for cleaning, pickling, rustproofing and drying processes.

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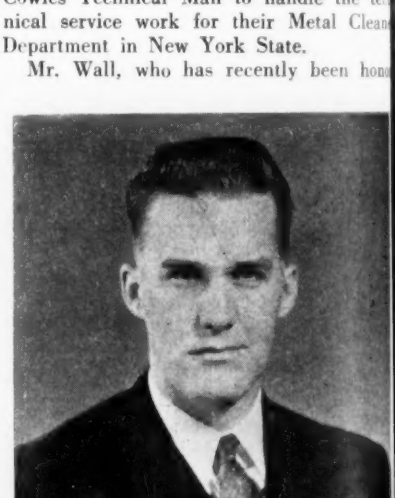
Joel N. Cooper

Mr. Cooper, whose headquarters will be Meriden, Conn., started with Detrex in 19 and was active in the Industrial and D cleaning departments prior to his connecti with the Alkali division. He will take E knowledge of a wide range of cleaning app cations, having had considerable experien in both the solvent degreasing and alka spirits washing phases of industrial met cleaning.

The *Cowles Detergent Co.*, Cleveland, Ohi announces the appointment of *Henry G. Wa* 128 Westminster St., Buffalo, N. Y. Cowles Technical Man to handle the tec nical service work for their Metal Clean Department in New York State.

Mr. Wall, who has recently been hon



Henry G. Wall

ably discharged from the Army, was educat in Buffalo Schools and Genesee Wesleyan He has covered the New York State i dustrial field for many years as a technica engineer on surface coatings and finishes He has also operated a manufacturing bus ness in Buffalo, and has a well rounded tech nical background which will enable him t render valuable service to the metal work ing industries.

Frederick C. Strong

rederick C. Strong III has joined the nical staff of the *Enthone Co.*, as a De- pment Chemist.

r. Strong received his B. A. in Chemis- from Swarthmore College, and his M.S. Lehigh University.

efore joining Enthone, he was employed *Superior Metal Company, Lea Manu- turing Co.*, and most recently as an in- ctor at Wesleyan University.

---

he *Optimus Equipment Co.*, Matawan, J., manufacturers of mechanical metal ning and drying equipment, has an- nced the appointment of *Marcel C. Boss*,

Marcel C. Boss

Chief Engineer in charge of design and oduction operations.

Mr. Boss, who has had a long and varied perience in the manufacture and use of h equipment, was born in Paris, and was ducated at the famous French engineer- g school, Ecole Centrale de Paris. For- rly an engineer with Carrier Engineering Company, in London and Paris, Mr. Boss tablished his own organization, Mabor Company, in Paris in 1930, specializing in

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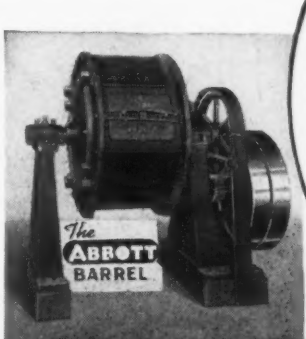

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the manufacture of metal washing and drying equipment. Such machines were installed in a wide number of important manufacturing locations throughout northwestern Europe, especially in munitions and aircraft plants.

In 1942, Mr. Boss came to the United States, at which time he joined the staff of *Hanson-Van Winkle-Munning Co.* as an engineer. In 1944, he became a member of the executive staff of The Optimus Equipment Company in which capacity he has been active in developing the design of an increasing number of new types of equipment.

The appointment as of January 1, 1945 of Mr. *A. S. Woodard* as Assistant Chief Engineer has just been announced by Mr. *Y. F. Hardcastle*, Vice President of the *Pennsylvania Salt Manufacturing Co.*, Philadelphia, Pa. Prior to this appointment, Mr. Woodard was Senior Chemical Engineer. Other appointments effective March 1, 1945 in the Company's Central Engineering Department were announced as follows: Mr. *J. P. Evans*, Senior Electrical Engineer; Mr. *R. R. Walden*, Senior Mechanical Engineer; Mr. *P. F. Dorney*, Senior Civil Engineer; and Mr. *J. W. Dadley*, Senior Design Engineer.

The *George Scherr Co.*, manufacturers and distributors of precision measuring instruments, optical inspection tools and gages, has just announced the establishment of its machine and precision exhibit at its new location, 200 Lafayette St., corner of Broome, New York 12, N. Y. Located in the heart of New York's machinery district, the new Scherr exhibit is currently being visited by plant officials from all parts of the country who are interested in the latest developments in precision manufacturing, measuring and inspection. Here, works managers, chief inspectors and superintendents will find the entire Scherr Limited Budget Inspection Laboratory in actual operation. Shop men with measuring and inspection problems are especially invited to view this exhibit.

ELECTRODEPOSITION OF IRON-TUNGSTEN ALLOYS

(*Concluded from page* 153)

is greatly reduced by an increase of temperature. The conversion of the unstable iron, initially deposited, to the stable form must involve the loss of the excess energy which resulted from the discharge of the ion at the elevated temperature. This excess energy may be supposed to bring about the further reduction of the partially reduced compound of tungsten in the film at the cathode and yield an iron-tungsten alloy.

Although the theories presented may explain the reduction of the tungstate ion in the presence of certain metallic cations, the problem of the deposition of pure tungsten from aqueous solution without a codepositing metal still remains unsolved. The similarity of this problem to that of the deposition of chromium a few years prior to the development of the chromium plating bath justified the hope that the electrodeposition of pure tungsten from aqueous solution will be accomplished soon.

Acknowledgment

The junior author wishes to express his deep appreciation to the Weston Fellowship Committee for the award of the Weston Fellowship which made this research possible.

References

Part of a thesis submitted to the Graduate School of the University of Wisconsin in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

1 Assistant Professor of Chemistry, University of Wisconsin, Madison, Wis.

2 Formerly graduate student and Weston Fellow (1941-42), University of Wisconsin; now with Barrett Division, Allied Chemical & Dye Corp., Philadelphia, Pa.

4 C. L. Faust, Trans. Electrochem. Soc. 78, (1940).

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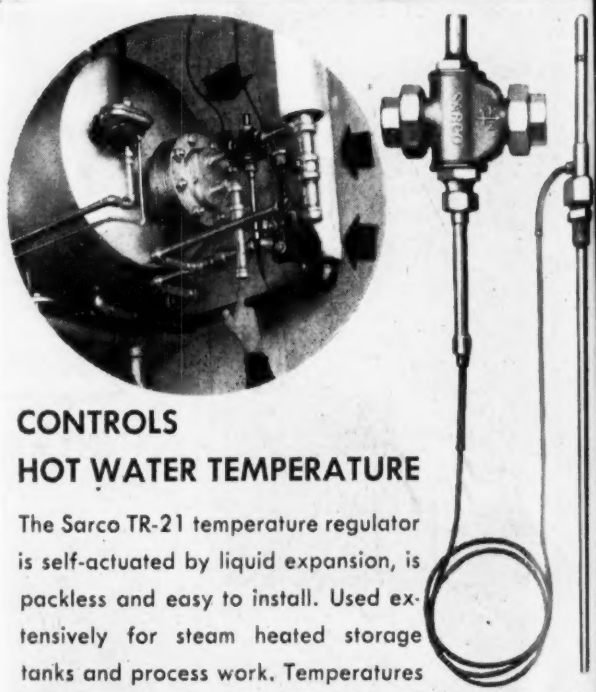

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Associations and Societies

American Electroplaters' Society

Toronto Branch

Meeting of March 9th, opened at 8:45 P. M. Attendance was 45. One applicant elected to active membership. Notice of cancellation of Convention this year was received regretfully. An advertisement which appeared in local papers recently offering to set anyone up in the plating business, was reported stopped by the *Toronto Better Business Bureau*. The cost of the information was $2.00 to the gullible.

Mr. Arthur W. Johnson, of the *Empire Brass Co.*, London, Ontario, was present for the first time in seventeen years. Members from Kitchener, and other nearby cities also attended.

The speaker for the evening was *Mr. Bernard Martin*, Assistant Director of Research, *McGean Chemical Co.*, Cleveland, Ohio. His subject was "Bright Nickel Plating."

Mr. Martin readily answered dozens of questions his interested listeners propounded and apparently enjoyed the fun. He said water used for a plating bath and having a high magnesium content might easily cause trouble eventually.

A rousing vote of thanks was tendered Mr. Martin, and the meeting adjourned at 10:30.

W. S. Barrows.

Los Angeles Branch

Los Angeles Branch of the *American Electroplaters' Society* celebrated the 15th anniversary of its founding with a well-rounded program of business and technical discussion at the Hotel Rosslyn on March 2.

Included among the 45 members and guests present were some 10 or 12 of the original 35 who established the branch in 1930, including *Robert Gripp* of *Cadmium & Nickel Plating Co.*, first president; and *Marcus Rynkofs* of the *Liberty Plating Co.*, first secretary.

Applications for membership were submitted by *Frank Denham* of the *Denham Rustproofing Co.*; *Joseph Ahumade*, *Cooper Screw Mfg. Co.*; and *Lee Davis* and *Warren R. Sales* of *Advance Plating Co.*

President *Joseph Sunderhaus* officiated at the initiation of *John Hodge*, *Charles Stoughton* and *John D. Hamer*.

The request of *Dr. R. M. Thomas* for transfer from Baltimore-Washington Branch to Los Angeles Branch was received and approved.

A newsy letter from *R. J. Andrews*, formerly of Los Angeles Branch, now president of the recently organized branch in Australia, was read by Secretary-pro tem *Harold Schoonover*. The letter was received with added interest because of the presence at the meeting of Flying Officer *Clyde Harris* of the Australian Air Force, whose peace-

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time activity is operating the *Edson Plating Co.* in Melbourne, with his brother *Nolin Harris.*

The Branch voted to accept an invitation from *Kaiser Steel Co.* to make a visit to the plant on the night of April 9. In consequence, the regular monthly meeting scheduled for that night was moved forward to April 16.

In response to a rousing inspirational talk by Marcus Rynkofs, who contended that, with effective collaboration of all members, the membership of the branch could easily be increased from the present 135 to more than 200, it was voted to hold the first fall meeting, September 10, in the form of an open meeting. Every man in Southern California who is eligible for membership is to be invited to the open meeting by Membership Committee Chairman *E. W. Wells* and his committee assistants.

Ernest Lamoureux of the directory committee reported that the volume of branch members and Pacific Coast plating industry listings was in the hands of the printer and would be ready for distribution within a week or two.

The educational session of the meeting was highlighted by a spirited discussion on plating of silver. Educational Committee Chairman *Earl Coffin* introduced the subject by explaining that he had tried for months to get some members to prepare a paper on silver plating and, failing in that effort, had finally decided to give a talk on the subject himself. That none could have done better than Mr. Coffin was the opinion of the audience when the discussion terminated.

Mr. Coffin cited the three groups into which metals on which silver is plated fall: pewter, such as table ware; copper base—copper, brass, German silver; and the steel group.

The pewter group, Mr. Coffin declared, is the one which job shop platers most frequently receive for handling in their plants. He defined pewter as an alloy of tin and lead or tin and antimony. The material known as "white metal," he explained, while it ranks among the better grades of pewter, must still be included in the pewter group.

The speaker pointed out that the pewter objects brought into a shop usually have a heavy coating of oxide. To remove it he recommended immersion in a muriatic acid bath. No specific time can be prescribed, he said, as the required immersion may vary from a quick dip to five minutes.

Mr. Coffin accented the importance of polishing on pewter. Because of the low melting point of pewter, he explained, it calls for a definite knack of polishing. Individual operators must figure out what type of polishing wheel is most suitable to their task. He added, however, that of late a greaseless compound is being used successfully in place of sand bobbing.

"Until the outbreak of the war limited the supply of copper, it was the practice to use a flash of copper in silver plating," Mr. Coffin said. "In a good copper strike you hang the article in for about five seconds. If it comes out with a nice, clean sheen, you know you are ready for plating.

Mr. Coffin emphasized that as much harm can result from overcleaning as from undercleaning.

"The copper strike," he continued, "will greatly simplify the plating process because copper is one of the easiest metals on which to deposit. After the war, when restrictions are lifted, it will be advisable to put on a flash of nickel."

Concerning polishing, Mr. Coffin hazarded the opinion that there are probably not more than six men in the United States who can burnish silver with so-called modern methods as effectively as was done by the old-time hand burnishers. Although present methods of polishing are faster and cheaper, in Mr. Coffin's opinion they cannot do as good a job of polishing because of the difficulty in getting into corners, depressions and indentations in the surface.

Mr. Coffin was asked how long the plating period should last. He replied that in his plant two hours is taken to plate.

One shop owner countered with the remark; "If I can't get enough silver on in half an hour, I throw it out and start over."

In respect to the amount of metal and cyanide in the solution, another plant owner explained he carries 3½ ounces of silver in the solution and free cyanide at the ratio of 4 ounces to the gallon.

A problem of one plater was outlined as follows:

"We have to put from one- to three-thousandths of silver plate on drill rods. Because of the curved shape of the rods, the deposit has a tendency to peel. We tried chromium, but still failed to get proper adhesion and the plate would eventually come off like a tube."

The plater explained that the problem was ultimately licked by using several deposits: Copper, lightly and directly, on the basis metal; silver over the copper and then nickel. The drill rods then are placed in a hydrogen induction furnace at temperature up to 1500 degrees. The effect, it was explained, was to alloy the basis metal to the copper, nickel and silver and resulted in a sound, non-peeling plate.

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News from California

By FRED A. HERR

Expansion of metal finishing plants is in the air in Southern California. Virtually every week in recent months there has been news of shop expansions or entirely new plants.

Noteworthy is the fact that such expansion programs, as a rule, have been drawn with an eye to the postwar period as much as for accommodating current war contracts.

Prominent among firms which have decided to get their metal processing facilities ready to meet peacetime production is *Peabody-Acker, Inc.*, building hardware manufacturers, 5816 Hooper St., Los Angeles.

During the war 95% of the firm's plating facilities have been devoted to heat treating aluminum aircraft castings and grinding and polishing stainless steel kick plates. Its wartime plating room facilities consist of eight tanks, including units for brass, bright nickel and copper. A small addition to this shop was recently completed.

In preparation for the company's postwar resumption of the manufacture of builders' hardware, construction was started in March on a 70x50 foot plating room addition to be used in finishing such postwar items as door knobs, casement fasteners, push plates, etc. Building and equipment will cost approximately $30,000, of which $7,000 will be spent for new bright nickel and chromium tanks, replacement and additional brass and other tanks, generators, rheostats, grinders, etc. Carl Jackson is the Peabody-Acker plating foreman.

Another company with ambitious enlargements underway is *Crown City Plating Co.*, 175 South Fair Oaks Ave., Pasadena, of which *Ray Bray*, past-president of Los Angeles Branch, is foreman. Crown City Plating has plans for a $14,000 factory addition.

Other Southern California firms carrying out enlargement or expansion programs include the following:

Hard Chrome Engineering Co., 1717 E. Slauson Ave., Los Angeles, building addition costing $2,000; *Maritime Brass and Bronze Works*, Harbor City, new building, $1,[illegible]; *Hughes Die Co.*, new 56x107 foot building of undisclosed cost; *Western Electrochemical Co.*, Los Angeles, factory addition, $[illegible],000, and new refinery, $130,000.

Flying Officer *Clyde "Jack" Harris* of the Australian Air Force was a visitor in California on an Air Corps plane ferrying mission in mid-March. Prior to entering service, he was active in the *Edson Plating Co.*, Melbourne, which he operated in partnership with his brother, *Nolin Harris*.

During visits to San Francisco, Los Angeles and San Diego, Harris took time to inspect local plating plants. In Los Angeles he visited the shop of *Cadmium and Nickel Plating Co.* presided over by *Albert Gripp;* and also made calls at the headquarters of *Pacific Enameling Co.* and *L. Butcher Co.*

Harris told a representative of *Metal*

ishing that what impressed him most in west coast metal deposition circles was the tremendous progress being made in new processes and techniques, the activity he noted in plastic plating, and the wide extent to which bright alloy plating and zinc plating was being used.

William Venzel has returned to Los Angeles as Southern California representative of *Detrex Corp.*, Detroit, and has resumed membership in Los Angeles A.E.S., in which he was inactive for some time while working in Alabama.

Cannon Electric Development Co. has converted a section of its plating room in its Humboldt Street factory into a department in which experimental work in tin plating aluminum is being carried on. Developments have been conducted successfully to the point that actual production on tin plating aluminum electrical connectors is expected to get under way some time in April, Superintendent Carroll McLaren reported.

A three-unit barrel plating outfit, with cleaning tanks, degreaser and other auxiliary equipment was installed in the experimental department.

Frank Sisto has sold his *Beverly Hills Plating Works*, 237 North Robertson Blvd., Beverly Hills, Calif., to his brother, *Denapo Sisto*, head of *Sisto Plating Co.*, 1317 East Florence Ave., Los Angeles.

Frank Sisto operated the Beverly Hills plant for about 10 years. Before that he worked in the plating department of *U. S. Spring & Bumper Co.* and other Los Angeles plants for a number of years. His plans for the future were not disclosed.

Stanley Rynkofs, Naval Intelligence, Honolulu, H. I., was confined to the Navy Hospital there for the past three months following an operation for a knee injury which he underwent in December. At the time of entering the service in the spring of 1944, Stanley was shop foreman of Liberty Plating Co., Hollywood, and sergeant-at-arms of Los Angeles Branch, A.E.S. Marine Corporal *Gene Rynkofs*, Stanley's brother and also a former plater, was recently transferred from shore duty in Honolulu to sea duty aboard a warship in the South Pacific.

Manufacturers' Literature

Protective Coatings

A new six-page broadside on its Koroseal Tape RX and MX and Korolac RX, modern, easy-to-apply protective coatings for plating racks and masking work has been published by *The B. F. Goodrich Co.*, Dept. MF, Akron, Ohio, and is now available upon request.

The broadside describes the composition

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**Ready for distribution about June 1st*

of Koroseal, and outlines some of the versatile forms in which it is used in the industrial field. These include tank linings, in which it handles safely all the common plating and pickling solutions, among them chromic and nitric acids.

Advantages of Koroseal Tape RX and Korolac RX, Koroseal in solution, in resisting acids and alkalies in plating rack service are described, and methods of application given. The broadside also tells the functions of the recently announced Koroseal Tape MX used for masking.

Batch Cleaning Equipment

The *Optimus Equipment Co.*, 127 Church St., Matawan, N. J., manufacturers of washing, rinsing, pickling and drying equipment for metal parts, has just issued *Bulletin 4E2*, entitled, "Batch Cleaning in Portable Metal Washing Machines for Production Maintenance and Repair." This Bulletin describes portable machines of the dip-agitating type (single and double load) and the spray type. All of these machines can be used for cleaning, washing, paint stripping, rust prevention, rustproofing, rinsing, chemical treatment, coating, etc.

Settling and Dewatering

Bulletin No. 1144, describing and picturing a comprehensive line of settling and dewatering equipment has just been published by *Claude B. Schneible Co., Dept. MF*, 2827 25th St., Detroit 16, Mich.

This equipment, designed for use in disposal of the effluent or sludge from wet method dust collectors, is also adapted to product recovery systems, slag, frit, slurry, silt, chemical and industrial wastes. Tanks of various types and capacities—rectangular, conveyor, truck, railroad track, concrete and skimmer—are shown in this bulletin.

Airblast Equipment

A new illustrated catalog has just been published by *American Foundry Equipment Co.*, 555 South Byrkit St., Mishawaka, Ind. describing its complete line of Airblast equipment, which includes Rooms, Cabinets, Tanks, Suction Guns, Nozzles, and Accessories.

A copy of this catalog can be obtained by writing direct to the manufacturers or its district sales representatives.

Color Chart

Ferro Enamel Corp., Cleveland, Ohio, manufacturers of porcelain enamels, colors and other materials for the coating of metal products, has just published a Color Chart, showing its Oxides, suitable in producing colored porcelain enameled ware.

The chart is designed to show base-colors and blends. From the base-colors, the blends shown can be made, as well as many other shades and colors. Oxides are manufactured in the Color Plant of Ferro Enamel Corporation.

Charts are available to companies interested upon request and it was felt that by making this publication available at this time, it would help manufacturers and others in the development of Postwar products.

Tarnish Resistant Plate

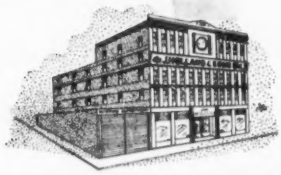
Special Chemicals Co., 36-38 Irving Place, New York 3, N. Y., has issued a new circular which describes and gives the directions for the use of Spekwite No. 12, a tarnish resisting plate. Copies may be obtained by writing to the company at the above address.

Air-Cleaner

The first issue of Westinghouse *Newsfront*, a new monthly publication by the *Westinghouse Electric and Manufacturing Company*, will appear in April.

The four-page report, printed in two colors and illustrated with drawings and photographs, will contain short articles describing the latest achievements by the company in the fields of scientific research, engineering and production. Featured in the first issue are a round-up on the company's annual report to stockholders, a story on a new application of the Precipitron air-cleaner for the removal of fly-ash, and a picture page illustrating recent Westinghouse developments.

Requests to be placed on the mailing list should be addressed to the Editor, Westinghouse Newsfront, 306 Fourth Ave., Box 1017, Pittsburgh, Pa.

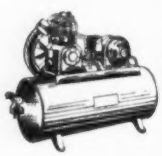


J. HOLLAND & SONS, Inc.

Electroplating and Finishing Equipment and Supplies

MOTOR GENERATOR SETS
All Sizes and Types
Rheostats 50-1500 amperes with or without meters.

V-DRIVE POLISHING LATHES
Sizes 3-15 horsepower. Complete unit is ball-bearing, totally enclosed, Sturdy construction.



SPRAY PAINTING EQUIPMENT
Spray guns, Air compressors, Spray booths and complete paint finishing units. Baking ovens.

J. HOLLAND & SONS, Inc.
276 South Ninth Street Brooklyn 11, N. Y.
AT BROADWAY

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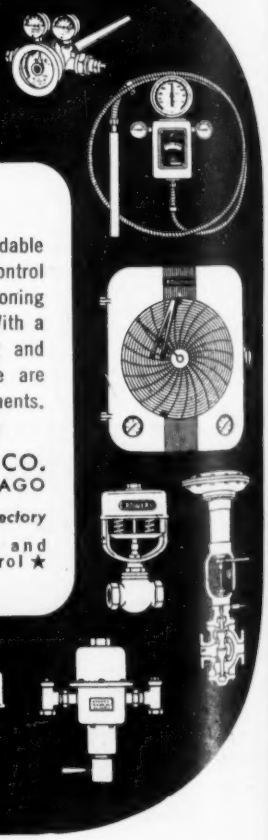
TEMPERATURE and HUMIDITY
CONTROL



When you want accurate and dependable automatic temperature or humidity control for Industrial Processes or Air Conditioning Systems call in a Powers engineer. With a very complete line of self-operating and compressed air operated controls we are well equipped to fill your requirements.

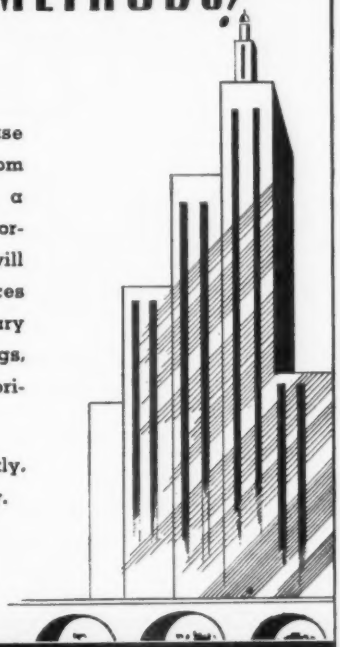
Write for Circular 2520

THE POWERS REGULATOR CO.
2719 Greenview Avenue, CHICAGO

Offices in 47 Cities—See your phone directory

50 Years of Temperature and ★ Humidity Control ★

MODERN INDUSTRIAL CLEANING METHODS!



Removal of heavy oils, grease and drawing compounds from steel parts often presents a difficult problem, which no ordinary cleaning material will solve. AHCOLOID 70 produces the clean surface necessary for paint, phosphate coatings, electroplating or further fabrication.

And it does its work quickly, efficiently and economically.

95TH YEAR

APOTHECARIES HALL CO.

WATERBURY 88 CONN.

PERMAG
Cleaning Compounds

— for Cleaning METAL prior to Finishing — and the factors required in the Cleaner for the job —

SPEED . . EFFICIENCY . . ECONOMY . .

This triple combination is outstanding in PERMAG COMPOUNDS, embracing these strong points that have made PERMAG a leader among cleaners in the metal fabricating field.

PERMAG Compounds help meet the demand for today's high output in many manufacturing plants producing war material.

Wherever the removal of dirt, grease, oil and foreign matter from metals preparatory to finishing is required, PERMAG Compounds do the work—quickly and dependably.

Whenever you have a tough cleaning job let our Cooperative Service help you. Write or 'phone.

MAGNUSON PRODUCTS CORPORATION

Main Office, 50 Court St., Brooklyn 2, N. Y.

Representatives from Coast to Coast. Warehouses in principal cities. In Canada: Canadian Permag Products Ltd., Montreal

Stop Dollar Loss from RUST!

Tectyl lets NO moisture reach the metal—gives tested, proven, *positive* protection against rust or corrosion—for as long as two years! Easy to apply and remove, economical to use. One of the five specialized Tectyl types will solve your special problem. Write today . . . tell us your corrosion-prevention needs. We will send Tectyl bulletin with complete application data.

TECTYL
Stops Rust

VALVOLINE OIL COMPANY

Finest Lubricating Oils Since 1866

470 Culvert Street Cincinnati 2, Ohio

Refinery at Butler, Penn. General Offices, Cincinnati, Ohio
New York - Atlanta - Detroit - Chicago - Los Angeles
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DAVIS-K-PRODUCTS CO.

MAKERS OF

Gold Plating Solutions in All Colors

100% Pure Gold Content Guaranteed

Special rapid high amperage fine grain structure golds for Radar and acid test government specifications.

We ship all over the country—immediate delivery.

Write or call our experts about your plating problems.

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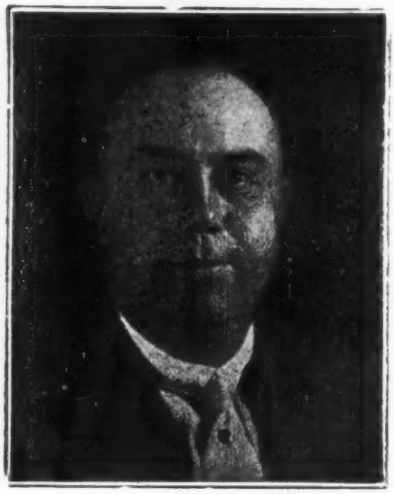
Obituaries



Frank J. Hanlon

We indeed regret the passing of Frank J. Hanlon, president of the Chicago City Plating Co., 216 North Jefferson St., Chicago, Ill., who died suddenly, at the shop, Tuesday, March 27, 1945.

Mr. Hanlon was one of the real old-time members of the American Electroplaters' Society. He served terms as secretary and treasurer, and president of the Supreme Society of the A. E. S. Mr. Hanlon also served at one time as editor of the Monthly Review.

We extend our sympathy to Mrs. Hanlon and his brother James, who is also associated with the Chicago City Plating Co.

Jay P. Orbin

Jay P. Orbin, president of J. P. Orbin Co., 81 Walker St., N. Y. C., passed away recently at Orange Memorial Hospital after an illness of three weeks.

Mr. Orbin is survived by his wife, Mrs. May Souza Orbin.

We extend our sympathy to Mr. R. S. Leather, president of The Lea Manufacturing Co., in the passing of his father who died Tuesday, March 27.

SHOP PROBLEMS

(*Continued from page* 162)

Bright Nickel

Question: We are very much interested in obtaining information regarding a bright nickel process for nickel plating on copper phonograph record plates.

Any information that you can give us on this matter will indeed be greatly appreciated.

T. S. P. Co., Inc.

Answer: Bright nickel processes suitable for this application are subject to patent, and may be obtained from local plating supply houses.

We are forwarding a tear sheet from our 1944 *Buyers' Directory* which lists suppliers of bright nickel processes.

Polished Brass

Question: Kindly advise if you know of a polishing compound for polished brass finish which could go from the wheel to the lacquer room without first going through a cleaning solution.

G. C. Co.

Answer: We do not know of any polishing compound of this type, but lacquers are available which will tolerate a certain amount of grease. We would suggest that you communicate with your local supplier for a suitable lacquer.

If you take the precaution of fanning off the work with a dry wheel after coloring, the grease film remaining will be so thin that any lacquer which has the slightest tolerance for grease films will be suitable.

Tarnish Prevention

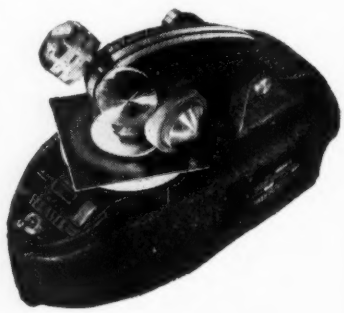
Question: Kindly advise how to tarnish proof silver plated parts.

I have noticed a small label on silvered articles, on sale in various stores, marked "Tarnishproof." Is this a patented process?

F. B. S., Inc.

Answer: There are a large number of proc-

Calibrated
FACTS
on
WEARABILITY



Yours in Advance with the Taber Abraser

No need for guesswork in the testing of your own or competitor's products for wearability or resistance to surface abrasion. The Taber Abraser gives you the facts with scientific precision—yet the procedure is as practical as it is accurate. Eliminates time-consuming, expensive performance tests. Used by scores of textile manufacturers for testing the wearing qualities of all types of fabrics, even the sheerest.

Write: Full details on the Taber Abraser and the Taber wear testing method described in new handbook. Write for your free copy.

TABER INSTRUMENT CORPORATION

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The Taber Test Proves What Wears Best

LaMOTTE CONTROL EQUIPMENT
for the
ELECTROPLATER and ELECTROTYPER

As an aid in the control of plating baths of
NICKEL, ACID ZINC, TIN, CYANIDE
ACID COPPER, CADMIUM, BRASS and BRONZE

LaMotte Block Comparators

for pH tests to accurately control the acidity and alkalinity of nickel, zinc, tin or cyanide baths. Inexpensive and easy to operate. A test can be made in a few minutes.

LaMotte Acid-Copper Analytical Set

for accurately determining and regulating the acid and copper content of the bath to insure uniform results.

Other LaMotte Outfits for determining Chlorides, Nickel Content, Iron Content and positive control of Cyanide Copper, Acid Zinc, Cyanide Zinc, Cadmium, Brass and Bronze plating solutions.

Write for further information.

LaMOTTE CHEMICAL PRODUCTS CO.

Originators of the Practical Application of pH Control

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ODDS and ENDS

The Printed Page:

In the February issue of *Machine Shop Magazine* (England), under the heading "New Patents," we were stopped short by the word *Vice* in bold face type. Naturally, our scientific curiosity induced us to read further, since even with our limited knowledge of patent law we could not see how such a patent would stand up in court. Our composure was regained, however, when we learned that it was just the British way of spelling *Vise!*

Industrial and Engineering Chemistry, in a review of a report by *E. C. Crawford*, states that among the supplies we captured from the Germans on the Western front were 2,000,000 *tons* of frozen meat. Even estimating a million German soldiers on this front, it comes to 4,000 lbs. per man, or 11 lbs. per day for a whole year. One way to beat the Germans would be to make them eat all that meat!!

Headline from the *N. Y. Times*: *"Navy Releases Oil to Warm Civilians."* Proving, no doubt, that them as has, gits!

Classified Ad: *"Plating tanks, buzz bars and generator for sale."* Probably for plating *buzz* bombs!

We look forward to seeing an ad in which the manufacturer admits that his product contributed *absolutely nothing* to the success of the B-29 Superfort—but is a good product anyhow.

Honor Is Its Own Reward:

When *Dr. Lucas P. Kyrides* (Monsanto Chem. Co.), who developed the first synthetic tire, was honored by the *American Chemical Society* last month, his company wished to present him with a set of synthetic tires on the occasion of his receiving the first Midwest Award. The O. P. A. turned down the request!!

Slips That Pass:

From a jewelers' publication: *"Silver cyanide should not be permitted to stand open as it will dry out—."* If it does, the buyer will know that he has been paying silver prices for water. The theoretical silver content of silver cyanide is 80.5% and most reputable producers guarantee a minimum of 80% which is equivalent to a purity of 99.4%. This doesn't leave much room for water content.

Note to Prof. F. and the A. E. S. Research Committee: Technically speaking, it's *adhesion* of deposits, not *adherence.*

How Much Do You Know:

(*Prepared by George Black*)

Designate the following statements with a "T" if true and an "F" if false.

—— 1. Phosphating is the application of an insoluble phosphate coating on ferrous metals only.

—— 2. Welding may be performed before or after phosphating at the discretion of the contractor.

—— 3. To expedite production, the racks and baskets used for pickling or oiling may be used for processing.

—— 4. Variations in the color of the coating may be caused by the carbon content of the steel being treated.

—— 5. A good phosphate coating should be of coarse crystalline structure.

—— 6. Meta- and ortho-silicate cleaners are preferred to hydroxide cleaners when cleaning prior to processing.

—— 7. Phosphate coatings may be removed by immersing in inhibited hydrochloric acid at room temperature.

—— 8. Oil after-treatments decrease the corrosion resistance of phosphate coatings, but tend to make a more attractive finish.

—— 9. Phosphate films tend to lose their water of crystallization when heated to temperatures above 400°F.

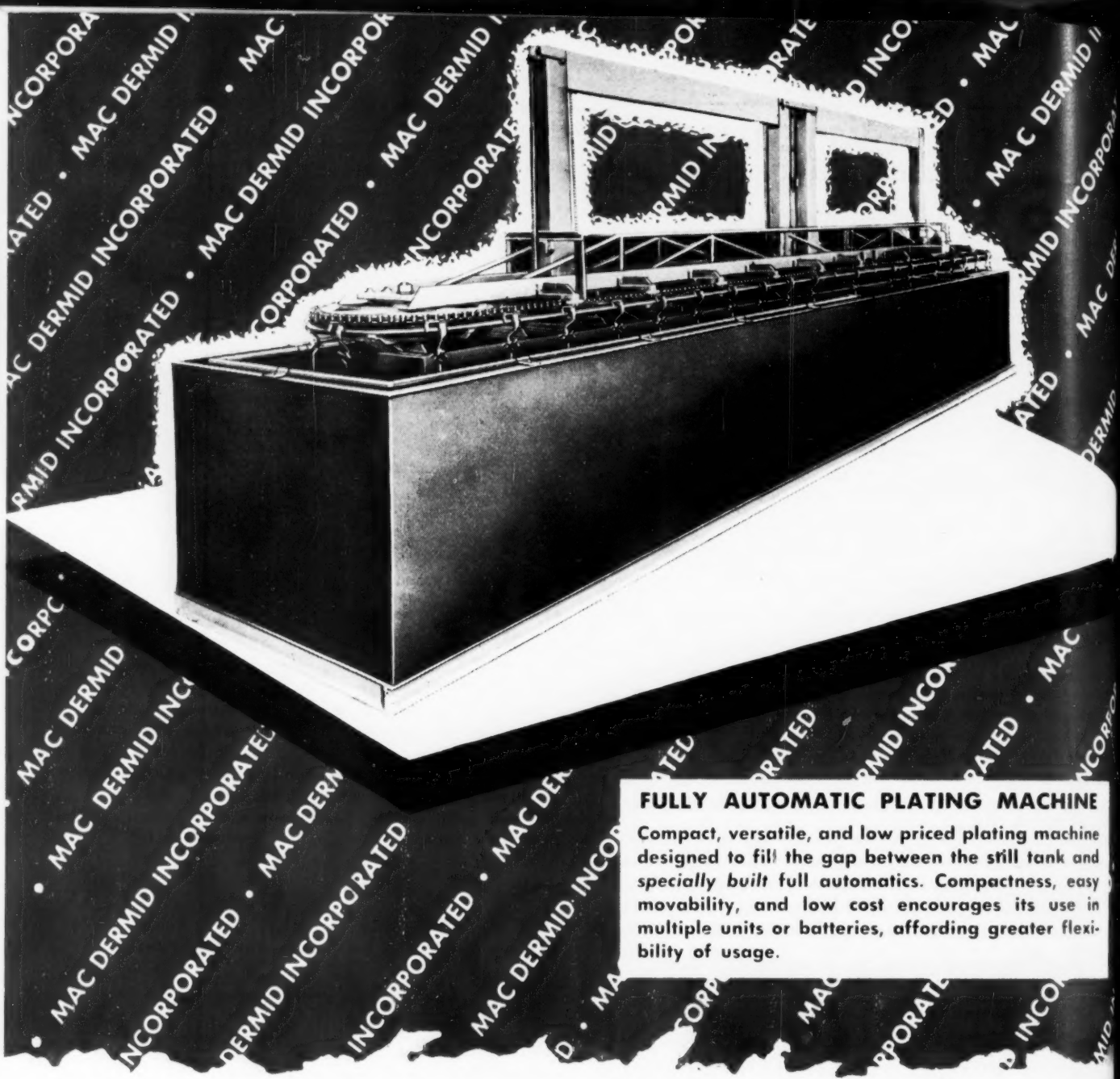
—— 10. An oxalic acid dip immediately after cleaning serves the same purpose as the "wiping" treatment.

See answer key on page 186.

Slogan of the Month:

Come Across For Those Across—Buy War Bonds!

To polish to a high lustre your post war production, check the improved Lupomatic DEBURRMASTER equipment and compounds.



FULLY AUTOMATIC PLATING MACHINE

Compact, versatile, and low priced plating machine designed to fill the gap between the still tank and *specially built* full automatics. Compactness, easy movability, and low cost encourages its use in multiple units or batteries, affording greater flexibility of usage.

Equipment for New England

MAC DERMID INCORPORATED is the established sale and service headquarters in New England for many of the most reputable metal cleaning, finishing, and plating equipment manufacturers. Our Service Engineers, operating from Waterbury, are equipped and trained to help you determine the most desirable metal cleaning, finishing, and plating equipment for your individual need. Be sure and consult with him concerning your present and post-war plans and place your orders as early as possible for prompt deliveries.